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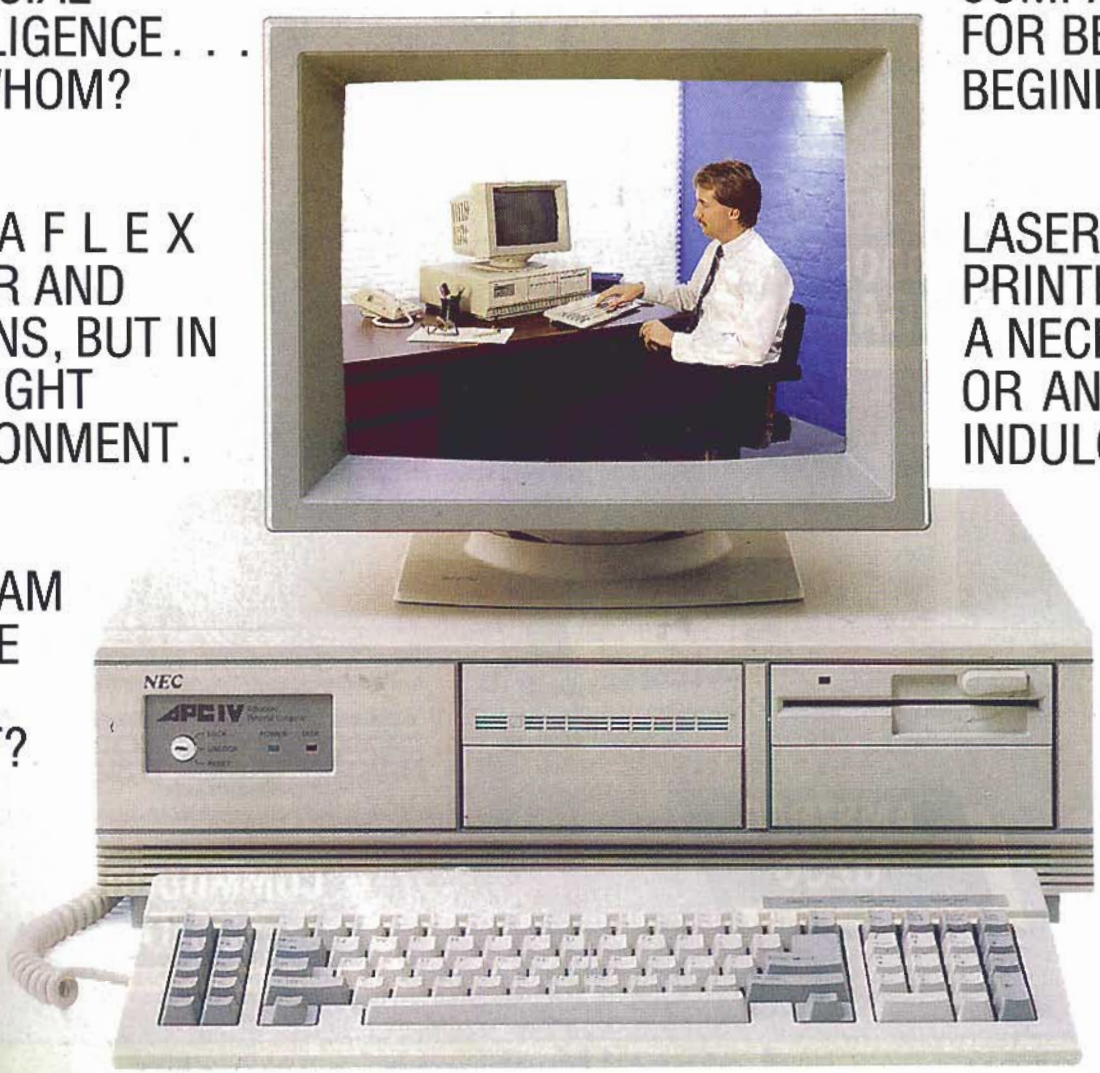

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PROGRAM SPECIAL THIS ISSUE

PRINTER ROUNDUP – pt.2 a comprehensive survey of printers on the N.Z. market.

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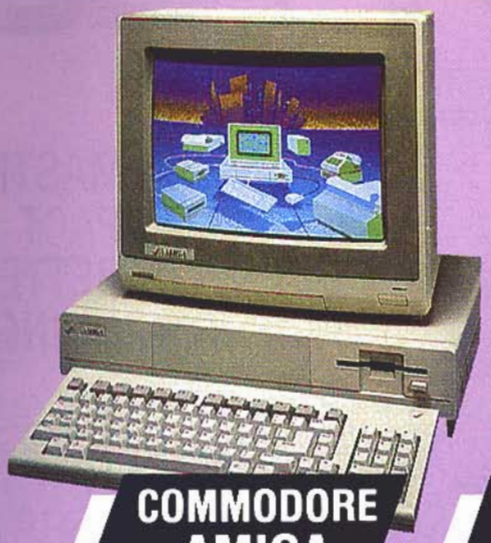

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Covering the Field

One of the exciting things about publishing in the computer technology field is that there is a constant stream of new product and new information coming on line. Much of it is relevant to computer users across the board – whether they are business purchasers and users or enthusiasts.

As the publishers of New Zealand's most widely read computer magazine this means there is a juggling act to perform every month in order to present an interesting and informative magazine for all of its readers.

Surveys of Bits & Bytes 70,000 plus readers reveal a pretty comprehensive and varied range of people. There are students and new comers to computing, intent on learning the basics; there are those who have been involved since the early computing days in New Zealand and whose technical knowledge is comprehensive; there are others who need to keep in touch in order to use the technology in their workplace – and of course, there are those who combine all of these needs.

During the past year we have broadened our coverage to include topics of interest to business users, as well as enthusiasts. Increasingly we are finding those interests coincide. However where business users are more interested in buying utility type software, for instance, enthusiasts often enjoy writing these themselves or trying programs others have developed. EVERYONE – whether business or home user – likes playing games!

For these reasons we have introduced a program special this month, designed as a loose insert for readers who enjoy programming and it is our intention to run these specials regularly. So keep on sending in your programs and your programming tips.

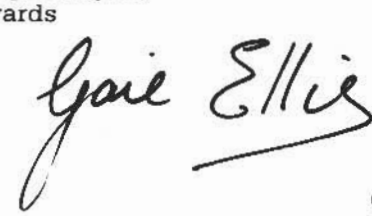
We have also found the worlds of finance and computing are becoming increasingly interdependent. This month our business readers are introduced to some aspects of foreign exchange matters in a new financial column.

There is also the second part of our very comprehensive computer printer roundup. It's hard to believe there are so many printers on the market and it is not difficult to understand why the buyer gets confused and doesn't know where to start when seeking out a printer as many phone calls to our office would indicate.

Finally, a word about NEWSBYTES. This is a new fortnightly newsletter we are introducing for Bits & Bytes readers who are looking for industry information from around the world as opposed to the regular news, *reviews, columns and surveys we will continue to bring* you monthly through the pages of Bits & Bytes.

If you have comments, suggestions and ideas for Bits & Bytes don't keep them to yourselves. Perhaps you would like to write for us, review books for our bookclub or send in some programs for our next special. We look forward to hearing from you,

Regards



Gaie Ellis,
Managing Editor.

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BITS & BYTES

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PROGRAM SPECIAL
A lift-out of games and utilities contributed by our readers

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Not only fibreglass

New Zealand's KZ7 entry in the America's Cup series at Fremantle, enjoying (at the time of going to press, at least) considerable success, is relying on high technology not only in the fibreglass construction which is causing so much controversy among its competitors.

Because small percentage gains in performance are critical at yacht racing speeds, weather information is passed to the yacht crew right up to the start of each race. Four buoys placed strategically around the course send data every minute to a shore-based Quattro PC, recording such factors as wave height and strength, water and air temperature, wind speed and maximum wind speed.

Studied in conjunction with data from satellites and weather baloons at 7am on race day, the weather is matched by shorebound meteorologist Bob McDavitt to a similar pattern for a previously monitored day, and a prediction made on that basis. It is then transmitted to a remote screen aboard the tender boat, where an ICL PERQ computer is installed, and last-minute information passed by radio to the yachties.

The program was written by ICL's Mark Hutching.

PCs picked for Victoria

Performance, full compatibility for running IBM PC software in a networking environment, and price were the major factors in Victoria University's evaluation of computers which resulted in the choice of the Commodore PC 10 and PC 20 recently.

Unlike the nationwide polytechnic evaluation, the computers are being supplied in standard form. "We left it up to the suppliers to give us the best configurations," says Dr Jim Baltaxe of Victoria's Computer Services Centre.

"They were completely bog standard, nothing other than standard configuration, with two floppy drives, 640Kb RAM, and a monochrome screen. We ran a review of a number of MS-DOS PC clones, and much to our surprise Commodore did extremely well in all tests, being very cost-effective and reliable."

Under its dealership arrangement with Commodore, the centre sells computers direct to other university departments and provides all end-user support and training. It is also branching out to undertake evaluations for third parties, and will examine portable PCs and printers in the near future for Victoria.

Some 10-15 Commodore PCs a month are expected to be supplied, "for a considerable period", according to Dr Baltaxe.

Fast-track CAD

Named Grades (graphical route alignment design and earthworks system), a CAD package which has been developed by BHP Engineering is said to be a major advance in civil engineering. A productivity advantage of 20 to 30 times that of conventional methods is claimed, with reductions in costs and engineering brought about by the speed with which road and railway designs can be completed.

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New association formed

The Association of Independent Computer Engineering Companies was recently formed in Auckland, for the benefit of suppliers of office and computer equipment and to enable them to offer national service cover on their product ranges. As all members are currently servicing electronic office equipment in their respective areas they can offer their services nationwide.

"It is important to offer the user of modern office equipment an efficient and professional service that understands the pressures when computer equipoment is not working," says association chairman John McGregor, "All our members are already successfully operating in this environment."

Forecasting costs in seconds

An Australian printing company has developed a comprehensive software system which can calculate in seconds all costs of processing and materials, both in total and cost per thousand, with mark-ups required, for job estimation and full financial accounting functions.

P and I Printers Pty Ltd has already had enquiries from 500 printers in 52 countries, and the system is being installed in a company owned by the Aga Khan in Nairobi.

Programmers at home

Skellerup Systems Ltd, the Christchurch company which sells add-ons for PCs as well as developing its in-house manufacturing software, is starting a trend which has been forecast for years.

Seven programmers and support staff have been added to the payroll in the last month or two, but instead of working in the Woolston office they are doing their programming at home. Not working under contract, they are Skellerup employees, the only difference from the norm being their place of work.

"We've found it's cheaper to supply somebody with a PC at home than provide the office space and equipment here," says general manager Sean Joyce. Another factor is that a programmer may not necessarily want to work 40 hours a week, as in the case of, for example, a mother with young children who wants to continue working.

Skellerup has found the arrangement to be satisfactory all round, with little trouble so far with scheduling visits so that the office isn't suddenly filled with programmers.

Distributor appointed

PAXUS has appointed Phoenix Software of Auckland the distributor for MAESTRO, the UNIX-based multi-user accounting software, in New Zealand, Australia and the Pacific Islands.

Written in a "C" based fourth-generation language, MAESTRO is aimed at the financial and distribution accounting needs of small to medium sized businesses. Phoenix managing director Peter Robson says the emphasis will initially be placed on appointing a number of retailers in both New Zealand and Australia, but the company also expects to sell some systems directly to end-users.

DSIR programme

An Innovative Technologies Contracts programme has been launched by the DSIR to support projects through the research and development phase to commercialisation. It is intended to assist with evaluation, gie financial support, and also offer access to DSIR technical support, under terms of a contract, not a grant.

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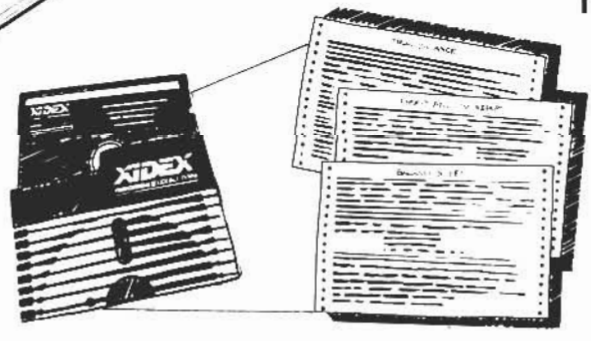

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Big order for education

In what has been described as the largest single order of microcomputers yet placed in New Zealand, more than $1 million worth of equipment has been delivered to 13 polytechnics, technical institutes and community colleges from Southland to Auckland.

More than 700 computers were involved in the contract, some of them being bought by technical college staff members who were able to take advantage of the special conditions but paid for them separately, including sales tax. Of the 42 invitations to tender sent out, 25 replies were received and the shortlist narrowed down to six, the successful tenderer being Computer Imports with the Exzel.

"We did a comprehensive evaluation on criteria of cost, quality of componentry and construction, performance, supplier support, availability of spares and that sort of thing," says Derham McAven, manager, Computer Resource Centre, Christchurch Polytechnic, who has been in charge of the project.

"Several of those in the shortlist were in the clone category, and several brand names. We changed the Exzel configuration from standard, with a non-IBM PC keyboard. We are using an extended keyboard with the cursor away from the numeric keypad, something spelled out by a number of tutors. The original IBM keyboard is a bad design, not allowing the user to take advantage of the computer's ability."

The bulk order was made possible by a change in policy by the Department of Education, which until now has overseen every aspect of computer purchase by the technical institutes.

"This year they said we could do our own purchasing, independent of the Department," says Ross Clark, coordinator of computing at Carrington Technical Institute, who worked on the project with McAven. "The Department recommends a certain sum for computer equipment. All the schools co-operated and we got one discount for quantity, with another for dollar value."

However, some technical institutes declined to participate, and four bought similar equipment, but outside the main tender. One reason was the time factor, and some institutes were planning to have their new Exzels up and running a short time after receiving the machines.

No such hurry is evident at Carrington, with computer equipoment scattered about the new laboratories. "This is the first time we've been able to do it right," explains Clark. "We're setting it up and training staff, and aim to have full implementation next year."

Carrington's computer installations were started five years ago, before any government assistance, and now number several laboratories. Two more will be dedicated to the new Exzel machines. One will have 20 640Kb PC0s (no disk drive) Novell networked to a 150Mb hard drive for word processing with amber screens, and the other, with 12 PC0s (one with high-resolution colour) will be networked to an XT for management and accounting packages. Two more Exzels will be set up in tutors' offices.

"We expect to expand two labs a year," says Clark. "All full-time students will have computer experience for competence in industry, and we encourage all tutors in computer discipline."

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New AT completes range

Commodore has launched two products onto the market this month: the new C64C and their Commodore AT compatible.

Some time back there was talk from the US that the 64 would be dropped while the company strengthened and developed its business range but the popularity and demand for this machine has been so intense the decision was made to proceed with a third version.

There are few noticeable changes from the C64C which will be looked at next issue. The new family pack, which includes two games paddles, two joysticks, a range of games and a special GEOS coupon offer, retails at $765 (includes GST). On its own it sells at $595 inclusive and the GEOS offer is also included.

At the other end of the scale the new AT, which completes their range from the home to the multi-user environment, will retail at around $7,500.

This machine is expected to be available here at the end of the year or early February. It comes with 1MgB ram, 1.2 MgB floppy, or 20 MgB hard disk. It has two PC expansion slots, 6 AT expansion slots and an advanced graphics card is included as standard.

Commenting on availability which has been a problem worldwide with the Amiga, the Vice-president of Commodore Business Machines (International) in New Zealand last month, said the company accepted there had been supply problems this year. These had happened while Commodore was going through a rationalisation period. He believed this rationalisation had strengthened the company and that they were now strongly positioned to meet supply demands.

The new AT will be manufactured in Germany and the C64C in South East Asia.

Communicating computer

Apricot is working with British Telecom to develop a new computer with telecommunications capabilities. The PC manufacturer said recently that the project was begun a year ago, with research expected to continue for at least another year.

British Telecom has declined to confirm the project, saying only that it is "continually evaluating new products and partners", and that it isn't "company policy to comment on speculative reports".

Retail chain in NZ

Computerland, one of the largest computer retail chains has entered the New Zealand market, appointing Businessworld Computers Ltd as its major franchisee in New Zealand. It will be interesting to see how the Businessworld centres will expand their service range to comply with Computerland's multi-national model, particularly as Businessworld here has always focussed on the corporate market.

Like a number of the multi-national companies repositioning in New Zealand, the new organisation will be headed up by Australian management with their director of Asia Pacific region, Michael Mulcahy responsible for co-ordinating services for New Zealand.

The initial network here will comprise seven centres but the master franchise agreement allows for more to be added. Bruce Foulds, managing director of Businessworld says the existing structure will remain intact as the operational arm of the new organisation. At the same time it intends to continue its activities in the systems division.

WANGTEK—Out in front with half-high tape drives!

Wangtek was the first with Half-High Tape Drives, and set the standard for the industry with the Series 5000E.

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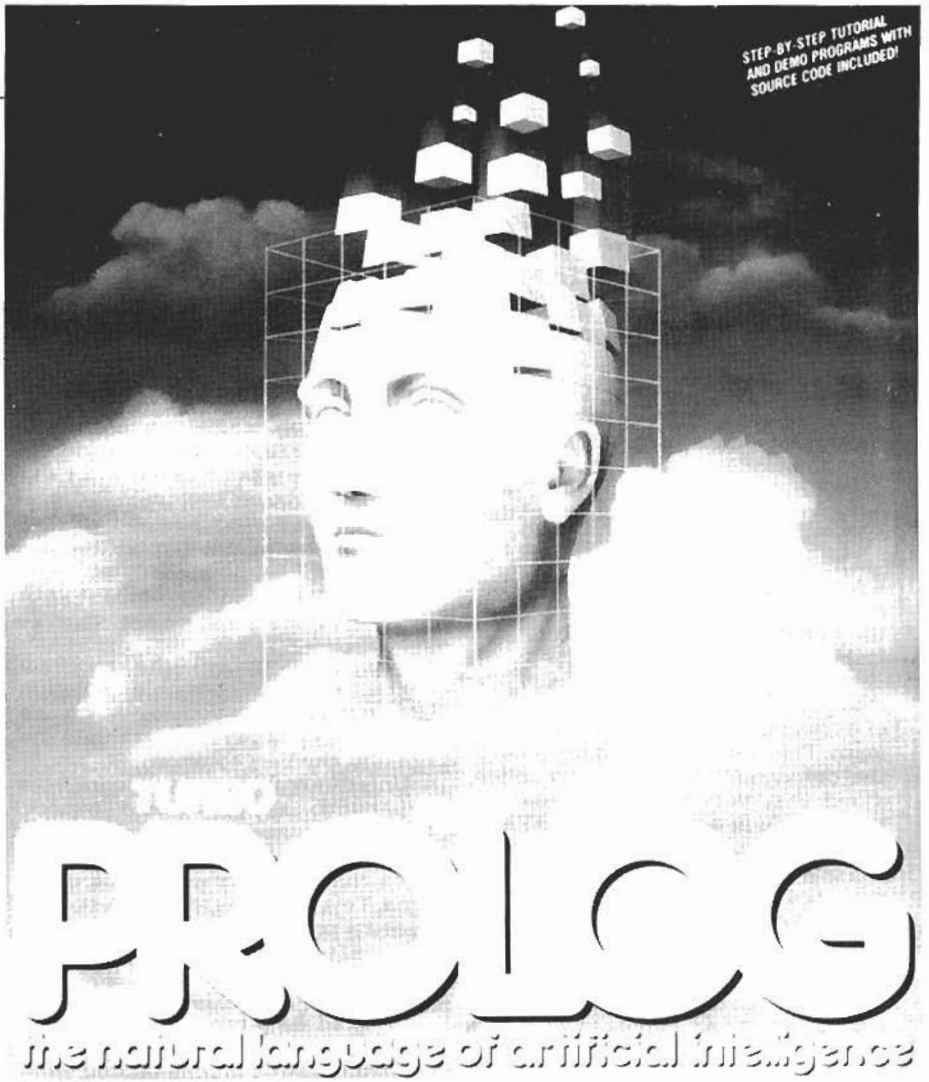
Turbo Prolog's brave new world

The abuse of the term 'Artificial Intelligence'

by John Highland



Define Artificial: Made by man, rather than occurring in nature. Made in imitation of something natural. Feigned; pretended.

Define Intelligence: The capacity to acquire and apply knowledge. The faculty of thought and reason. Superior powers of mind.

The claims on the cover of the manual said things like "TURBO PROLOG the natural language of artificial intelligence... 5th generation supercomputer power... introduces you to the brave new world of Artificial Intelligence."

The introduction stated, "Turbo Prolog is a 5th generation computer language that takes programming into a new dimension. Because of its natural, logical approach, programmers can build powerful applications such as expert systems, customized knowledge bases, natural language interfaces and smart information management systems."

I though this was all pretty exciting stuff as I sat down to discover this brave new world, but after running a few demo programs, I began to wonder if it didn't better fit the description of 'simulated logic'. (I later discovered that PROLOG stands for PROgramming in LOGic.)

Having felt a bit cheated I want to put artificial intelligence back into its proper perspective. The term 'artificial intelligence' has been much abused. Programs that manifest aspects of knowledge can be interesting, even impressive. The general perception of AI has focused on the 'artificial'. AI focuses on 'intelligence'! Most good AI programs aren't terribly useful, and many very useful, 'smart' programs aren't AI at all.

So-called expert systems are a case in point. These rule-based programs do not attempt to reason the way a human expert would. A human expert is not someone who is just following the rules. He has the experience to know when he is seeing an exceptional case, and he can recall relevant past cases to help him figure out what to do. AI theories of expert behaviour must describe how an expert knows when something doesn't fit his general rules and what to do about it. AI theories need to account for how experts change and add to the rules they use, based on the success or failure of those rules.

Artificial intelligence is a much more basic science than is popularly believed. Many of our best AI ideas require a great deal of work before they can become useful applications. And when an AI idea is turned into a useful system, in some sense it isn't AI anymore. The construction of such a system requires all kinds of non-AI programming effort to make the idea work in a real environment, on real computers, in some useful way. The fact that a program is based on an AI idea is no way to judge its functionality.

Artificial intelligence is the part of computer science concerned with designing intelligent computer systems, that is, systems that exhibit the characteristics we associate with intelligence in human behaviour – understanding language, learning, reasoning, solving problems, and so on.

Experimental systems include programs that:

1. Solve some hard problems in chemistry, biology, geology, engineering and medicine at human-expert levels of performance;
2. manipulate robotic devices to perform some useful, repetitive, sensory-motor task; and
3. answer questions posed in simple dialects of English (or any other natural language, as they are called).

There is every indication that useful AI programs will play an important part in the evolving role of computers in our lives. There is an important point here. Doing arithmetic or learning the capitals of all the countries of the world, for example, are certainly activities that indicate intelligence in humans. The issue here is whether a computer system that can perform these tasks can be said to *know* or *understand* anything.

So-called artificial intelligence

programs can be judged by their ability to generate:

a) Problem Solving: Programs that solve puzzles and play games like chess. Looking ahead several moves and dividing difficult problems into easier subproblems evolved into fundamental techniques of search and problem reduction.

b) Logical Reasoning: Programs were developed that could 'prove' assertions by manipulating a database of facts, each represented by discrete data structures just as they are represented by discrete formulas in mathematical logic. These methods, unlike many other techniques, could be shown to be complete and consistent. That is, so long as the original facts were correct, the programs could prove all theorems that followed from the facts, and only those theorems.

c) Learning: Certainly one of the most salient and significant aspects of human intelligence is the ability to learn. This is a good example of cognitive behaviour that is so poorly understood that very little progress has been made in achieving it in AI systems. There have been several interesting attempts, including programs that learn from examples, from their own performance and from being told. But in general, learning is not noticeable in expert systems.

d) Expertise: Typically, the user interacts with an expert system in a 'consultation dialogue', just as he would interact with a human who had some type of expertise – explaining his problem, performing suggested tests, and asking questions about proposed solutions. Current experimental systems have achieved high levels of performance in consultation tasks like chemical and geological data analysis, computer system configuration, structural engineering, and even medical diagnosis.

e) Robotics and Vision: Programs that manipulate robot devices. Research in this field has looked at everything from the optimal movement of robot arms to methods of planning a sequence of actions to achieve a robot's goals. Although more complex systems have been built, the thousands of robots that are being used today in industrial applications are simple devices that have been programmed to perform some repetitive task. Most industrial robots are "blind", but some see through a TV camera that transmits an array of information back to the computer. Processing visual information is another very active, and very difficult area of AI research. Programs have been developed that can recognise objects and shadows in visual scenes, and even identify small changes from one picture to the next, for example, for aerial reconnaissance.

Turbo Prolog itself

So, Turbo Prolog's approach is different from traditional programming techniques. Turbo Prolog is described as a declarative language. Pascal, Basic and other traditional computer languages are described as procedural: the programmer must provide step by step procedures telling the computer how to solve problems. The Prolog programmer need supply only a description of the problem (the goal) and the ground rules for solving it, and the Prolog system will determine how to go about a solution.

The program format is written differently and the user communicates in a more or less natural dialogue with it.

Simply, given a problem (for example a chess move) the program searches every possible solution before it presents you, based on the guide lines you gave it to evaluate the options, the best solution.

Unfortunately, it doesn't learn from experience as you would expect. Given the same task, it will still re-explore all the same options and produce the same answer in the same time. This brings us to the question of speed – provided you run Turbo Prolog on a fast machine it's not too bad.

One of the demo programs provided was called Geobase wherein was listed data relating to US geography.

Most of the questions I posed were answered reasonably quickly by the machine. To the prompt "query:" I asked "longest river" and the computer answered "missouri". I asked "shortest river" and the answer came "klamath", I asked "how many rivers" and was told "52 solutions". So of the 52 rivers listed in the data file I knew the longest and shortest. I asked "how many rivers in Ohio" and was told "2 solutions – ohio and wabish".

But when I asked "largest city" the PC AT compatible I was running the program on (which incidentally had a CPM processing power speed of 9.2 on Norton's index of speed compared with 1.0 for an IBM PC) took nine seconds to come up with the answer "new york".

Asking the same question while running the program on an PC XT compatible, the computor took an amazing 32 seconds to produce an answer. The number of cities it had to choose from was 462.

I found the same when running the demo program Towers of Hanoi, the problem where you have six disks of decreasing size on a pole and have to transfer the six, one by one, onto a third pole utilising one of the three poles provided, all in such a way that throughout the process no larger disk ever is placed on top of a smaller one.

On the PC AT compatible this took six seconds to perform, compared with a pedestrian 19 seconds on the PC XT compatible.

These results caused me to wonder if the speed of execution would presently limit the use and popularity of this package while running on micros. I understand that the speed problems of Prolog prompted the production of Turbo Polog, but to achieve even the speed of the Turbo version meant condensing the abilities of the language, thereby sacrificing some of the original features. I was told it was possible you couldn't therefore run a Prolog program directly using Turbo Prolog.

A lecturer at Auckland University advised that there was a trend among commercial programmers preparing expert systems to use 'C' as the programming language as there was more flexibility and the program was faster to execute. On the other hand, five pages of programming in Prolog may equal 50 pages of programming in 'C'.

So let's look at Prolog. The first official version of Prolog was developed at the University of Marseilles in France by Alain Colmerauer in the early 1970s as a convenient tool for PROgramming in LOGic. A program for a given application will typically require 10 times fewer program lines with Prolog than with Pascal.

Today, several well-known expert system shells are written in Prolog, including APES, ESP/Advisor and Xi.

Unlike, for example, Pascal, a Prolog program gives the computer a description of the problem using a number of facts and rules, and then asks it to find all possible solutions to the problem. In Pascal, one must tell the computer exactly how to perform the tasks.

But once the programmer has described what must be computed, the prolog system itself organises how that computation is carried out.

Although Prolog makes programming easier, it can also make severe demands on the computer. Turbo Prolog is the first implementation of Prolog for the IBM PC and compatible personal computers that is both powerful and conservative in its memory requirements. Turbo Prolog is a full-fledged compiler with a pull-down menu interface and full arithmetic, graphics and system-level facilities.

What can Turbo Prolog be used for?

There are a number of practical applications for Turbo Prolog. Here's a sampler of what you can do:

* Produce prototypes for virtually any application program. An initial idea can be implemented quickly, and the model upon which it is based tested 'live'.

* Control and monitor industrial

processes. Turbo Prolog provides complete access to the computer's I/O ports.

* Implement dynamic relational databases.

* Translate lanaguages, either natural human languages or from one programming language to another. A Turbo Prolog program was written to translate from Hewlett Packard Basic to C under UNIX on an HP-9000 computer for a total software development cost of less than $US7500.

* Contruct natural language interfaces to existing software, so that existing systems become more widely accessible. With Turbo Prolog it is particularly easy to include windows in such an interface.

* Construct expert systems and expert-system shells.

* Construct symbolic manipulation packages for solving equations, differentiation and integration, etc.

* Theorem proving and expert system packages in which Turbo Prolog's deductive reasoning capabilities are used for testing different theories.

Let's take a closer look at how Turbo Prolog differs from traditional programming languages.

Turbo Prolog is descriptive. Instead of a series of steps specifying how the computer must work to solve a problem, A turbo Prolog program consists of a description of the problem. This description is made up of three components, with the first and second parts corresponding to the declaration sections of a Pascal program:

1. names and structures of objects involved in the problem;
2. names of relations which are known to exist between the objects; and
3. facts and rules describing these relations.

The description in a Turbo Prolog program is used to specify the desired relation between the given input data and the output which will be generated from that input.

Execution of Turbo Prolog programs is controlled automatically. When a Turbo Prolog program is executed, the system tries to find all possible sets of values that satisfy the given goal. During execution, results may be displayed or the user may be prompted to type in some data. Turbo Prolog uses a backtracking mechanism which, once one solution has been found, causes Turbo Prolog to re-evaluate any assumptions made to see if some new variable values will provide new solutions.

Turbo Prolog has a short and simple syntax. It is therefore easier to learn than the syntax of traditional programming languages. It is compiled, yet allows interactive program development. A programmer can test individual sections of a program at any point and alter the goal of the program, without having to append new code. This would correspond to being able to try out any arbitrary procedure in a Pascal program, even after the program has been compiled.

Generally, Turbo Prolog is a useful educational tool for those studying expert systems. Auckland University for one, teaches Prolog in a second-year course in its Computer Science Department. The greater the processing power and the faster the speed it operates at, the more complex the tasks that can be executed using sophisticated languages and this will open the door to higher planes of 'simulated logic'.

Turbo Prolog
Artificial: yes
Clever: yes
Intelligence: not in my book
(Review copy supplied by The Computer Store, Milford, Auckland.)

A second NZ Conference on Expert Systems is to be held by Auckland University and Expert Software Ltd on February 2-4, 1987. For further information write to: NZES '87, Freepost 1758, PO Box 9396, Newmarket, Auckland.

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Methods to manage foreign exchange exposure

by Wayne Silver

A foreign exchange (FX) exposure can be defined as a transaction taking place at some future time in a currency other than the firm's base currency, and where the exchange rate between the base and foreign currency is free to move. It can arise in one of two ways. A firm may expect a receipt in a non-base currency, or conversely a payable due in a non-base currency (where the base currency is the firm's domestic unit of currency.)

A firm facing either of these transactions is in a position of foreign exchange exposure. One can quickly find examples of unpleasant consequences of such exposure in the financial press, soa firm should look to minimise its exposure, which reduces the risks associated with international transactions.

What are the alternatives available to minimise these risks? In attempting to answer this question I have made an assumption that the business is risk adverse in regards to foreign exchange transactions, and therefore is actively trying to minimise risk of exposure. However, a common fault with most businesses is that they want the best of both worlds – they want profit from favourable foreign exchange movement but protection from unfavourable. This is unrealistic, and dangerous, especially if the business is looking for a profitable experience on the basis of crossing its fingers.

A business which does nothing, either by choice or through ignorance, is by default doing something. It is placing itself in the business of predicting future exchange rates – a risky business at the best of times.

A business with an FX exposure should first sit down and write out a policy on its treatment of exposures. This policy will vary from firm to firm, depending on factors such as the number of transactions; the amount of currency involved in the transactions; the firm's attitude to risk; the degree of experience in FX dealing; elasticity of demand of the firm's product; the seasonal nature of the transactions and so on. All these factors will affect the degree to which the firm will attempt to minimise the exposure.

The most obvious method of minimising exposure is to invoice in the base currency in the case of an exporter, or ask to be invoiced in your base currency if you are an importer. (This may be a less likely option.) If this is done, there will be no FX exposure as the business will receive or pay a fixed amount of base currency.

Another technique used is that of leading or lagging, which is possible where a firm has both receipts and payments happening at a future date in a foreign currency. The trick is to match the receipts and payments so that they occur at roughly the same time and are of equivalent amounts.

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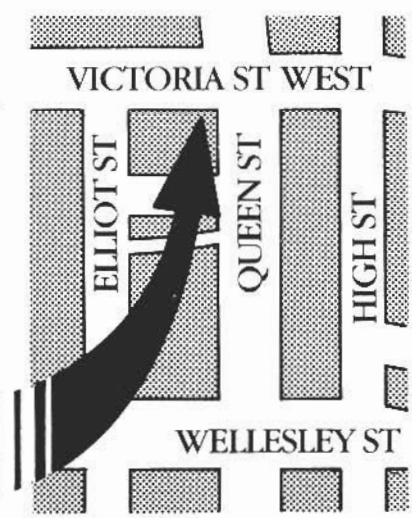

ACTION 934

A lead is where a receipt or payment is brought forward, and conversely a lag refers to the delaying of payment or receipt of foreign funds so that they can be dealt with at the same time.

An interest benefit or cost will obviously have to be included in the calculation, as for instance you would expect an interest discount for early payment to your creditors. A firm would then be "covered" in that adverse exchange movement in respect of receipts would be an advantageous move in respect of payments and vice versa.

Other options available involve the use of financial instruments designed at least in part for the purpose of minimising FX exposure. They are currency futures contracts; currency options; and forward contracts.

A currency futures contract is an agreement to either buy or sell a standard unit of currency at some definite time in the future at a determined exchange rate. No provision is made for delivery of the currency itself and net positions (profit or loss) are settled on maturity in N.Z. dollars. (In N.Z. $US futures are traded in lots of $US50,000.) An exporter will sell futures contracts for delivery in the quarter closest to the time when he receives payment, to cover the FX exposure.

Advantages in using a futures contract are that they are readily available to almost anyone who can pay the deposit. Disadvantages revolve around their inflexibility. In New Zealand only $US contracts are available in round lots of $US50,000 and can only be settled on the last Friday of each month.

Overseas currency options are now commonplace, but they are not to the best of my knowledge readily available in N.Z. However, as they may be expected to enter the N.Z. market place an explanation of their workings may be useful. A clemency option contract is a contract granting the purchaser the right, but not the obligation, to buy or sell foreign exchance at a specified price within, or at, a specified point in time. There are two basic types: the call option, which is the right to purchase foreign currency; and the put option which is the right to sell.

The major advantage with these currency options is the limitation of potential loss in the event of an adverse currency movement but unlimited potential profit if the exchange rates move in your favour. In the event of a favourable movement you let the option lapse. The major disadvantage with option contracts is that the premium paid for the contract is generally high.

The forward contract is one of the most common methods of hedging currency exposure used by corporates. It is a contract to buy or sell a fixed amount of currency at a fixed point in time at a set exchange rate. It is the ability to fix the future exchange rate, based on the day of the contract, which provides protection against exchange movements. A major drawback is that it also insulates against profitable movement.

The future fixed rate, called the forward rate, is not the future expected spot price, but is simply today's spot price plus or minus an adjustment for the interest rate differentials between the two countries. For example, an importer may have to pay ¥1,000,000 in February for computers. Today's spot rate against $N.Z. is 8900. The importer feels that the yen will continue to strengthen against the $NZ, so he takes out a forward contract to buy ¥1,000,000 at the forward rate of .8900 on January 15th. The rate is now locked in for his business.

Forward contracts are used because of their flexibility in amounts and timing. The major disadvantage is that the firm must establish a forward line with a FX dealer, which will be based on the firm's creditworthiness.

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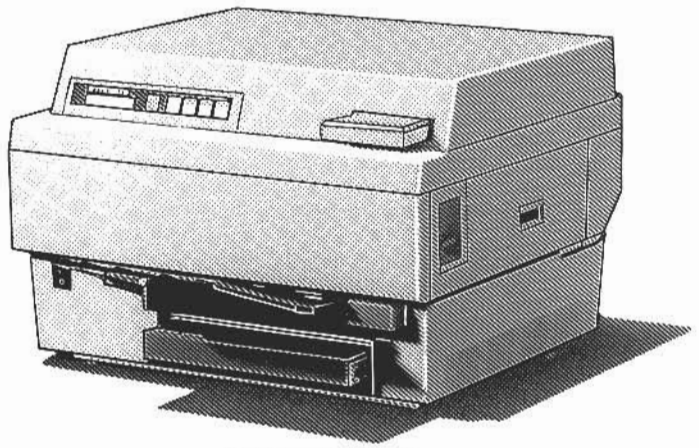

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BOOM... WHAT BOOM?

In this regular column we keep the business person in touch with developments in the microcomputer industry.

The research reports are prepared by Jenny Peacocke, Grant Furley and Phil Ashton at KMG Microlab, an independent consultancy established by the accountants KMG Kendons in Auckland.

Our contacts within the business computer market are wondering what has happened to the expected boom in computer sales prior to GST being introduced.

It seems to have been one big yawn.

Contrary to earlier industry suggestions, business people did not go on a computer buying spree to convert their systems before October 1. There was a short burst of activity four to eight weeks ago when the majority of MicroLab's clients were concerned that they were prepared for the tax charges, but since then there has been a lull out there in the market.

It would seem that those who felt they should be doing something have now acted, and others in business (a considerable chunk) have decided to weather the storm and control GST within their existing systems.

So the public were not fooled by all the fast-talk that GST would introduce a massive burden of work and reporting that could only be handled in a computerised business.

However, we may yet see a post-GST boom when managers realise that they cannot adequately cope with the extra workload, and weigh up the options of recruiting additional staff versus introducing a computer. Not forgetting those astute managers who have recognised that postponing a decision until after October 1 will allow them to claim the GST element on the computer against GST collected.

Apple Mac... here to stay

After a period in the incubator, Apple Mac now has a zest for life and appears to be establishing a niche for itself in the New Zealand marketplace. Initial attempts to launch the product here two years ago fell flat, partly because of poor positioning and pricing, and perhaps as significantly because of a dearth of suitable software.

The current push with the Mac may have the right balance. We have seen the release of a number of superb software products over the last three months, in particular Microsoft's Excel offering a spreadsheet, graphics and database. It draws upon the unique strengths of Mac, its very high resolution screen and quality graphics with its icon and mouse approach.

We have seen the Mac create a position for itself in the area of on-screen design. With Apple's laser printer, the on-screen design can be transferred to high quality reproduction on paper. Mac's on-screen design capability is attractive to businesses involved in public relations, publishing, surveying, architecture, product design and development, and of course those at home who wish to develop their creative and artistic flair.

Two years ago there was very little business accounting software. Bean counter from Paxus did not stand the test of time, nor did we ever see the promised Mac version of Sybiz. However, there are two products that seem to offer the reliability and features that are demanded of an accounting system of the Mac level. Management Accounting Macintosh has been modified for our business conditions. It offers debtors, creditors, cash book, general ledger and inventory control.

Apple Accounting is a UK-sourced product which is being promoted by the Apple importers (CED). Both these products from all accounts justify a mention in this article.

Apple Mac has introduced friendliness to the world of computing. If only it was contagious.

Project Management Software – reveal yourself.

We have had enquiries from a number of quarters recently, where businesses are manufacturing/building major one-off products involving millions of dollars in costs.

Their greatest need is for a computer system, in a multi-user mode, to control availability of labour and materials through a project management (critical path) software product. It is essential that this product interfaces to a job costing module so that costs can be accumulated by cost centres within jobs and to a stores control/purchase ordering module so that materials are available when the assembly process demands it.

MicroLab has put feelers out into the market place and drawn a blank. We see enormous potential for a software product of this type, particularly in construction, both building and shipping.

We hope to report back in this column next month that this market is being addressed and have some details for you.

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Action 932

Computers and the Curriculum Review

by Vince Ham,
Lecturer in Computer Education, Christchurch Teachers' College

The Report of the Curriculum Review called by the Minister of Education last year has now been released and is drawing considerable comment both within the education system and in the media. It is right that it does because the philosophies, policies, and recommendations encompassed in it are likely to form the backbone of a major revision of our education system over the next few years, and among the elements of the system likely to be affected most are the role and importance that computers are to have in education.

The review had two major purposes: first, to coordinate the community's opinions on fundamental questions about what should be taught in schools and how; and second, to make definite proposals for changes in the school system on the basis of those opinions. I would like to outline here the major findings of the review as they relate to computer use in schools, express some personal 'first reactions' to the review, and perhaps open up some discussion on the implications of the review findings for our schools and our children and their dealings with computers.

The bulk of submissions dealing with computers in education came in response to questions 1 & 2: "What do you expect of our schools?" and "What should young people learn and experience in schools?" The responses clearly showed that a need was felt for schools "to make stronger efforts to prepare people for a 'high tech' future". "Familiarity with modern technologies and the ability to use them wisely and with confidence" features largely as something schools should teach. Indeed, this need for computer competence seems to be seen as ranking only just below literacy/numeracy and social/cultural awareness under Question 2, apparently drawing more comment than science, physical education or consumer education.

Another interesting point is that pupils seemed to give computer competence an even higher priority than did the rest of the community. In answering Question 1 ("What do you want schools to do for our children?") the students' requests consisted "primarily of work exploration, life skills, and familiarity with new technology, especially computers."

This theme was repeated in their responses to the question of what changes they would like to see in our schools, where in a reversal of statistics for the community as a whole, they put "more modern technology and computer education" even above more "cultural awareness" teaching.

Commenting on the responses as a whole, the Committee states its general conclusion thus: "Students can be assisted by technology. Confidence and skill in making wise use of technology is expected of students and schools must plan to provide for the development of such skills. Computers should be available at all levels as a learning tool for children."

This is a very interesting conclusion as it focuses on a role for the computer that is still far from realised or even perhaps fully accepted in many of our secondary schools. The computer's role in schools is to be as a learn-

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ing tool, not as a subject to be taught. Moreover, all pupils, not just a select few, should have the opportunity to become competent and confident using the technology, and it is implied that this would best be achieved if pupils were exposed to them in a wide variety of subject contexts.

The committee acknowledges that achieving these aims will be expensive both in terms of money and in-service and pre-service training time for teachers. It also points out that although steps are being made, "the education system needs to move faster to keep up with the changes outside the school."

Part of the role of the committee was to make proposals on the basis of the public submissions. The proposals relating to computers state that: "special attention" be given to the role of computers, television and other media in education, "through research into the effect on children and their learning"; "students at all levels have greater access to computers as a tool for learning"; and "a national policy be devised" on the role of computers in education.

The conclusions to be drawn from the review as it relates to computers in education are clear, and are based on a widely felt concern to ensure our children can make the most of our increasingly 'high tech' orientated society. Helping to make children competent, confident, and discerning computer users is important. Giving our children greater and more equitable access to computer technology in schools is important. And using computers across the curriculum as tools for learning, rather than just as objects to be studied, is important.

By emphasising this computer-as-tool concept, moreover, they are perhaps not just proposing that a national policy be established, but also providing a philosophical outline for what that policy should be.

There is little that is surprising in the committee's findings, or really new in its proposals. In view of the amount of discussion that went on in and around schools at the time submissions were being formulated, it would be surprising if there were.

But the review may serve the very important function of distilling the current issues and giving rise to a thorough debate on its implications for the day-to-day practice of schools. For the proposals are not without potential for controversy, and their implications are considerable. There will, for example, be a great need for extensive in-service training for teachers on just how computers can be used as learning tools in their specialist areas. There will clearly be enormous pressure on the still very limited numbers of computers available in schools and on the timetables of computer rooms, as different teachers then incorporate computer related activities into their programmes of work.

Moreover, if priority is to be given to using computers as a tool for learning across the curriculum, priority to learning *with* computers rather than *about* them, it may give us pause to consider quite seriously the future content, or even existence, of computer studies courses in schools? In most schools, for example, these computer studies classes currently take timetable and very often philosophical priority over computer using classes.

If adopted, the 'learning tool' policy may require a reversal of those priorities. One may even postulate that computer studies as it is currently defined will (should?) die as a subject, since its main aim of developing general computer competencies will be better achieved for a greater number of pupils if a less exclusive, more ubiquitous, across-the-curriculum approach to educational computing were adopted. Pupils will learn all they need to know *about* computers by learning *with* them in normal classes.

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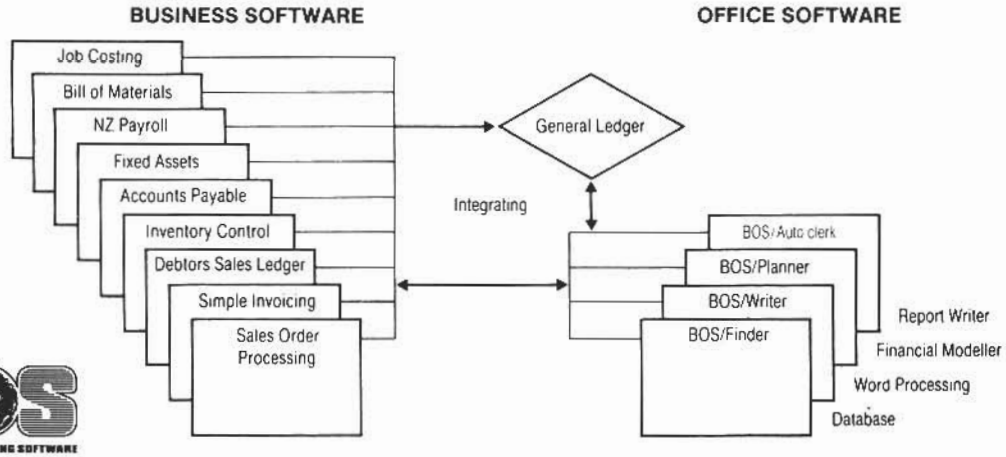

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Tips for CADets

by Steve Shilham

So with all of the furore that the computer industry has been creating, your interest in CAD has been aroused, your appetite whetted to the stage that you too would like to move your own company into this new technology. And why not? It is affordable at last, you may have a PC in your office already which is perhaps used only for the end of month accounts and maybe a bit of word processing. The nice salesman said that it costs only about $1000 for the right program, and you'll be away laughing.

Then again, look how long it took Fred (your engineer/architect/PCB designer friend) to get his system off the ground. It was three months before he managed to produce a scale plot, and look at all of the wasted time that he couldn't charge for while he was learning how to drive that mouse through all of those complicated looking menus, and drawing all of those "blocks" as he called them.

Be not fooled by the apparent availability of low cost CAD systems, people. No, you are not listening to the demented ramblings of a modern-day Luddite or some such thing.

CAD, whether it be a roomful of mainframe or a desktop micro, can, and in fact should, if it is working correctly, cause the most drastic revolution imaginable for anybody used to drawing on a board a revolution which should increase productivity by a considerable amount from the very early days and continue to increase it as time goes by. The fact that drawing quality improves and data extraction abilities exist is almost incidental in most cases. I have also seen the other, less attractive side of the coin, with users struggling for months to gain control over their new tool, and in some cases giving up in despair.

So what does one do to ensure as far as possible that the transition from manual draughting to CAD is as painless as possible?

The main area that most people seem to respect is, as always, the simplest and the most obvious. Why are we considering this costly transition? If one starts with a list of objectives it makes it far more likely that one will achieve them, yet many potential users go shopping with only the vaguest of ideas. While there are a range of reasons for looking at a computerised system, these reasons are not relevant or, more importantly, not relevant enough to justify the cost for many people.

It is important to know this before one embarks upon the time consuming and costly exercise of appraising the available systems. Let's look at some of the major advantages that such a system does offer over conventional drawing.

One of CAD's strong points is the ability to save portions of a drawing as items that may be inserted into any number of future drawings. These portions, usually called groups, shapes or blocks, may be moved around the screen to be used as part of the overall drawing. For instance, one can draw a wheel, save it as a known shape, and whenever future drawings require a wheel, it is simply placed at the relevant position.

Another strength is the ease with which existing drawings may be modified. Rather like using a word processor, a library of standard documents can be compiled which may be modified and re-saved.

While these two are probably the best known of the advantages, CAD also allows for systems to produce a full listing and even costing of a completed drawing, and it allows for the generation of a superlative quality of drawings, far better than could realistically be produced manually.

It facilitates a great ease of producing text and even automatic dimensioning. This advantage is manifold: text is produced much faster, it is very neat with a variety of available fonts allowing for a very high quality of output, and it also allows text to be produced legibly much smaller than would normally be possible. Automatic dimensioning obviously means that the dimensions will be correct too, with no need for any more measuring errors or checking.

With smaller drawings possible, we can now look toward a considerable reduction in storage requirements – that is, if you need to keep the originals, because if most of your drawings are saved on diskette then storage space for hundreds of drawings is reduced to a few square inches.

As a final attractive advantage of this type of system, let's not forget the interchangeability of drawing files, the ability of the surveyor to take a diskette with subdivision plans around to the engineer, who can then in turn take his modified version to the builder and so on.

For this type of facility, it is important that the surveyer, architect, builder etc all have systems which are capable of interchanging drawing files with each other, so obviously if this is an objective of the potential users, they must know what systems,

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if any, these other groups use.

In looking at these different areas, it is also important to realise that not all tasks require the same advantages or are suitable to the same benefits.

For example, a PCB designer will often be drawing identical components and can clearly benefit from the repetitive drawing ability. However, an architect producing one-off homes may find that clients purchasing an expensive set of plans are very impressed with high quality plans with beautiful hatch patterns and text styles. Local authorities may find that while CAD does not significantly reduce the time taken to put a drawing together, the advantages of being able to call it up and modify it as road, power, and drainage layouts change are well worth the change from manual draughting.

The advantages to different types of applications can be listed for ever, but the preceding demonstrates why one should have a clear idea why, if at all, one wants to install a CAD system.

Stage II must be what is the likely growth rate? How is your practice likely to grow into CAD usage? Will you require an integrated system or will each user be operating totally alone?

Will drawing files need to be exchanged to other users within the same company, and if so, locally or over the telephone? Do you require a straight draughting facility or one with 3D visualising, or perhaps even free space modelling and CAM/CIM type linkages? These decisions can save costly mistakes, and they may dictate whether one requires a micro, mini or mainframe system, or whether a retractable option or multi user is preferable.

..high quality plans with beautiful hatch patterns and text styles

With a clear idea of the immediate and longer term requirements, you have a better idea than about 80 per cent of potential CAD users and a good chance of finding what you're looking for, so how to go about looking?

An alarming number of people seem to compound their lack of objectivity by visiting every possible vendor of CAD. They sit through half a dozen demonstrations of Autocad by different suppliers, check out everything from Macdraw to Interograph and, having exhausted themselves and numerous vendors, not to mention wasting many hours of the time that they were presumably hoping to save by installing a system, they either give up in confusion and frustration, or come across a slick salesman who signs them up for whatever package he has learned to drive the demo of.

Don't visit every man and his dog, find out which systems are capable of giving you the facilities which your list of present and future objectives contain. If you really need a CAM system, don't waste time on micro-based units, and if you need multi-user, look at systems which can be retracted or at full multi-user systems. This sounds so obvious, but people have wasted as much as a full day of CAD dealers' time oohing and aahing at a system which was clearly not suitable for their intended purpose.

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users is that of the finished product. While one spends hours peering into screens, the finished output is what one actually works with. If you really need high quality ink or vellum A1 sheets, beware of anything which can't actually be shown producing them. Some systems can only output to a matrix printer!

It is about here that one can determine whether the vendor that one is dealing with is a serious CAD reseller, or just one of the many computer outlets who are attracted by the relatively high system cost of a CAD installation.

If you have come across a serious CAD house, it should have demonstratable plotting facilities. Don't commit yourself to a system until you have seen the intended configuration actually draw something and then plot it to scale. If your demonstrater cannot do that with relative ease, how likely are you to be able, and how much help is the dealer going to be able to offer you?

With the plot completed, ensure that the quality meets your expectations. Cheaper plotters produce uneven circles and arcs and can even skip over some portions of the drawing, especially if the parts are not good quality. Check that what you see is what you like is what you get.

Incidentally, don't forget that, because you use A1 sheets now does not mean that you have to use A1 with CAD, bearing in mind our comments earlier regarding accurate legible text and dimensions, and you may well be happy with A2 or even A3 size. Don't neglect the possibility of a logo printer instead of a plotter, either.

Other areas that you can investigate to help ensure your smooth transition include asking to talk to some of the dealer's previous sites. Look for someone who has installed CAD into a similar environment to your own. Find out how much assistance the dealer was able to give them, how quickly they were productive, and how helpful the dealer's training was. If they are happy, ensure that the staff they were happy with at the dealer are still there, or at least equally competent substitutes. You may well find that a customised system is best suited to your requirements too.

Ensure that the dealer has this ability too and again, check with a customised system user to see how well they were looked after. If the dealer can't provide you with what you want, don't do as some people do, buy the system anyway with warm reassuring noises from the dealer that someone can do that afterwards. Find a dealer who can show the ability to give you what you want when you want it.

In summary, be sure of what you need now, and are likely to need in the future. Look at systems with only these capabilities, check that the reseller can train and customise to your satisfaction, and check with at least one of his users to confirm that he really can perform. Despite what you may hear, or have suspected, a good tutor should have you producing productive drawings within a week using the standard uncustomised system, not the three to six months that some unfortunates have been known to experience.

Good luck and good shopping.

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The multi-user's database

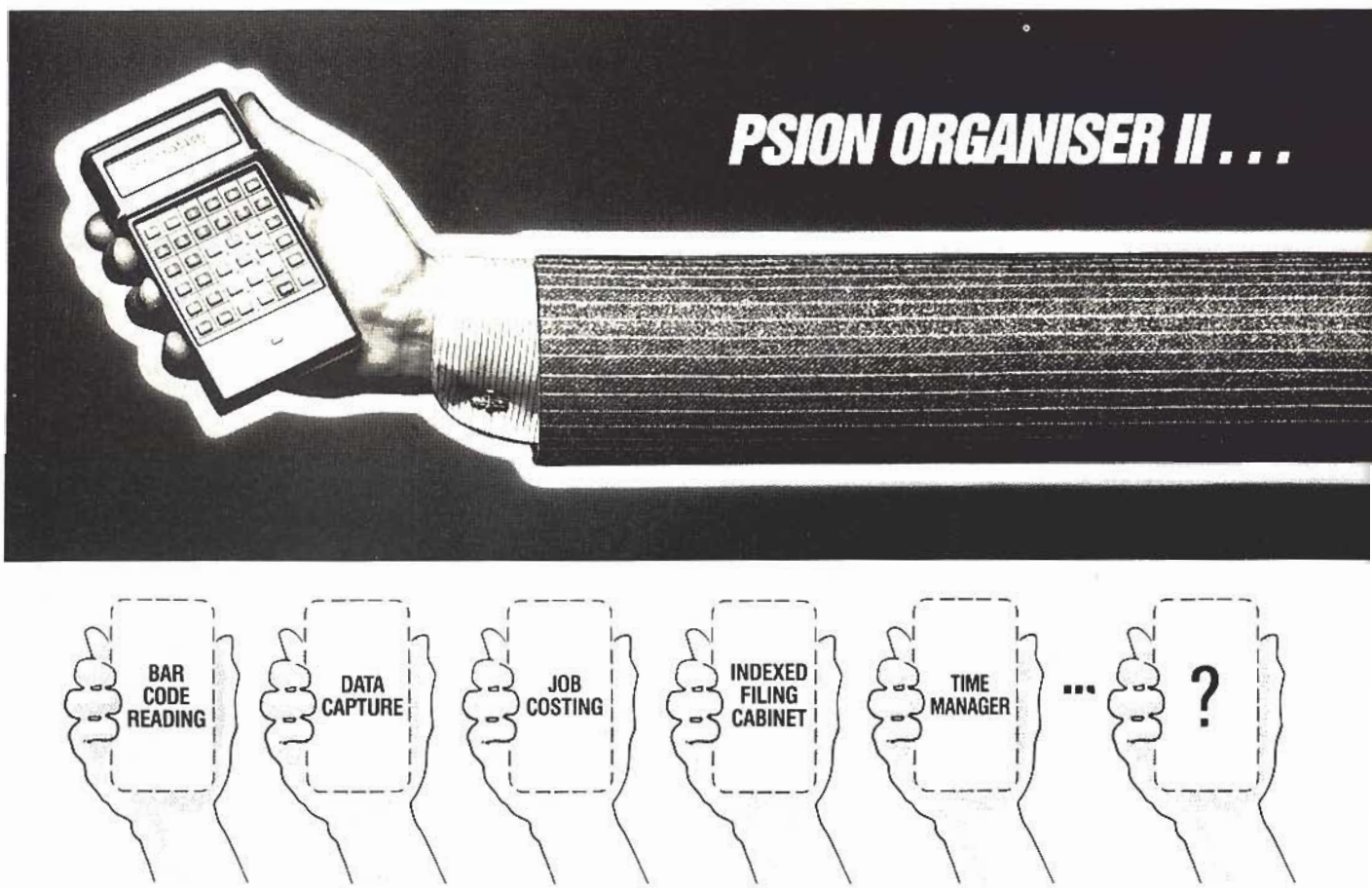
by Mark James

The multi-user products that we have been examining in this column have all been operating systems – that is, they all have the ability to turn a single-user microcomputer into a multi-user machine. Dataflex is not an operating system, and so lacks this magical capability; however, it is worthy of attention anyway, as it is one of the few database development tools that provide the monitoring necessary to support multiple users.

When Dataflex is run on an ordinary MS-DOS or CP/M computer, the result is a fine (if rather expensive) single-user database system. However, after connecting the computer into a network of like machines, Dataflex provides a database, application development tools, and multi-user security features that most network operating systems lack. Similarly, on upgrading to a multi-user operating system such as Xenix or Concurrent CP/M, which have no inbuilt database facilities, Dataflex will provide them.

Dataflex is a product of Data Access

A. The main menu screen.



Corporation, of Florida. It is distributed in New Zealand and Australia by Cowan Bowman Associates, who provided a demonstration system.

Database management

In concept, Dataflex is similar to many other database management packages on the market. It allows a relatively unsophisticated user to define types of records to be stored in files on disk; it maintains multiple indices by which records may be looked up or listed out; and it provides a screen-driven selection and report facility called Query which even an intelligent monkey could use to get information out of the database. For the more advanced user, Dataflex has a programming language rich with screen- and file-handling macros, and with the ability for the programmer to define more of them.

All operations in Dataflex are performed either through menus or by pressing function keys. There is no interactive command language, not even for the Query facility.

Files are stored separately on the disk, using the filing format of the host operating system. Each Dataflex file actually takes up several physical files on the disk: one for the data and one for each of the indices. Creating one database record involves physical writes to each of these disk files. Files are maintained in an ISAM hierarchical structure, but the multiple indices and the ability to link files gives the database many relational features.

The database limitations are not likely to be a problem for most users: 255 fields per record, 65,536 records per file and five files open at once. (These are 8-bit CP/M limitations, and are more generous under MS-DOS and the more common 16-bit version). Depending on the version, it is possible to have either five or nine indices per file, and each index may be made up of multiple fields. The indices are maintained dynamically by Dataflex as records are added, deleted or changed. Hardware failures or program bugs can cause the indices to get out of step with the data, but Dataflex provides index checking and rebuilding utility programs to fix things up.

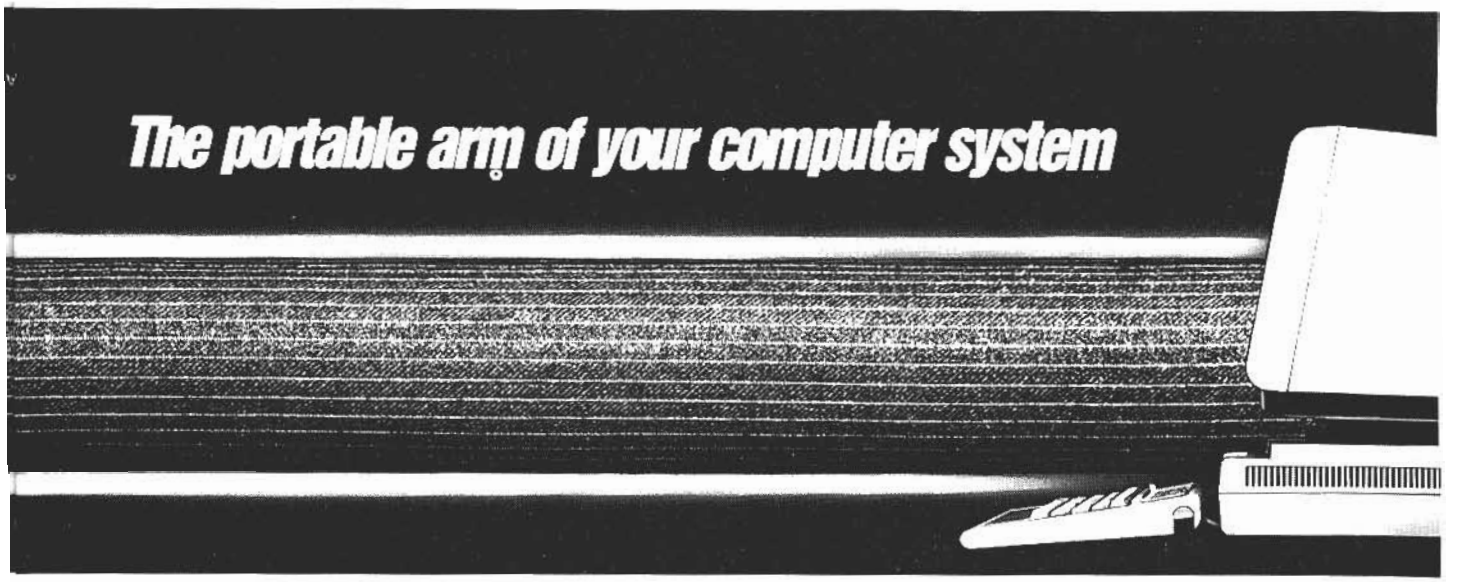
its applications are portable across many types of computer and network hardware

Three types of fields may be defined: character, numeric and date. Dataflex verifies that anything keyed into these fields conforms to the data type before accepting the record. However, the Query program does not perform this kind of check. Trying to select on an invalid data range, for example, will produce no error message, merely an inaccurate selection.

All database operations are done directly to the disk; Dataflex does no disk caching at all. Even if the system is instructed to read the same record twenty times, it would do twenty disk seeks. This is a characteristic of Dataflex as a whole, and not just of its database. If, for example, the user flips back and forth between a menu and a program, the system has to go to the disk for each flip. This constant disk activity drags down the performance of Dataflex on a floppy-disk system, although it is less of a problem with a hard disk.

Multi-user features

In a multi-user environment, Dataflex consists of two parts: the application programs which each user is running, and a central kernel which manages the database. The application programs take the form of semi-compiled pseudocode, which is run through an interpreter. The interpreter issues database requests to the kernel. There is only one kernel per system, even on a multi-user computer; in a network, it might be on a different computer. It is the kernel that provides multi-user security features



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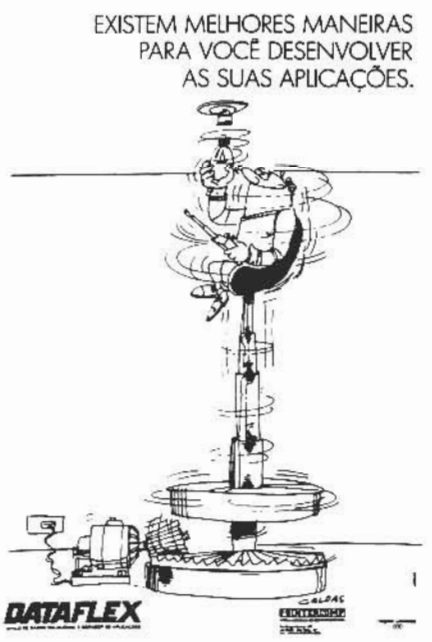
such as record locking.

Actually, Dataflex avoids the necessity of locking records if it can. Like the AMPS system, the Dataflex kernel keeps track of the latest copy of any record that is in use, even if more than one person is using it at one time; if the record changes because of one person's activities, the changed record is provided automatically to everyone else who is using it. This neat feature avoids most situations that require the overhead of record locking in other systems.

Unlike AMPS, however, which performs this record rereading at the system level and can therefore take advantage of its caching, the Dataflex kernel has to do its rereads through ordinary disk seeks. As we have seen, excessive disk activity is already likely to be the bottleneck of a Dataflex system. Even so, however, the rereading trick is a more efficient means of maintaining data integrity than standard record locking would be.

There are, of course, situations where record locking cannot be avoided. For example, when a large group of related records needs to be updated simultaneously and the user doesn't want anyone else to change them until the task is finished, a lock command has to be issued. Dataflex provides a LOCK command in its programming language.

No password or other access security is available through Dataflex itself, but Dataflex programmers can place password protection on individual menu entries. Since everything in Dataflex is accessed through menus, this provides at least a first level of security for sensitive programs. There is no provision whereby programs can test a user profile and conditionally execute functions depending on the user's privilege level. A programmer would have to design his or her own user profile records if this kind of security is required.



It should be evident by now that Dataflex, not being an operating system, depends upon programmers to implement features that would be automatic in a decent operating system. To this end, the Dataflex programming language is full of functionality. Since Dataflex has no interactive command mode, the only way to get at this functionality is to write and compile programs.

Those accustomed to database-oriented languages like dBase III will find the Dataflex language much more like a real programming language. It is a serious tool, intended for programmers and not for the end user, who is restricted to simple, automated routines like Query and Filedef. Its conditional structures resemble BASIC, while its file-handling commands are COBOL-inspired.

Dataflex programs (or "configurations", as the jargon goes) are compiled, not into machine language, but into a portable pseudocode that requires the Dataflex run-time interpreter to execute. Interpreters are available for a wide variety of microcomputer operating systems and networks, with rumours of Dataflex on the VAX sometime soon. Programs written for one Dataflex system are, in theory, portable to any other Dataflex system, regardless of hardware. There is a size limit of 84Kb of compiled code for any one program.

All operations in Dataflex are performed either through menus or by pressing function keys.

Not all aspects of the language are very programmer-friendly. The only way for one program to link to another is through the CHAIN command, with no way to return to the prog ram that executed the CHAIN. Parameter passing is limited to integer values and one text string, but not database records. In fact, all database files are closed before executing the CHAIN, so that the next program must re-open them, with all of the disk accessing that this implies. The overhead of CHAINs suggests that it is worthwhile trying to keep Dataflex programs within the 84K limit of a single module.

Like most programming languages, Dataflex operates on only one record at a time. If you wish to update something in every record in a file, you have to write a program loop that will find every record; you cannot, as in dBase, issue commands that apply to whole files at once. Also, like most interpreted languages, Dataflex is weak in mathematical functions. Perhaps for this reason, Dataflex has no spreadsheet.

These complaints, however, must be kept in perspective. Dataflex may have shortcomings when compared with full-fledged programming languages, but when stacked up against its real competition – dBase, Symphony, Open Access – it makes the others look like glorified report writers. Dataflex programs can be as complex as BASIC ones, and its filing system is infinitely more useful.

Dataflex is also weak in graphics, but this is understandable given the wide range of computers that it runs on. Until the world decides on respectable graphics standards, no computer program will ever have both graphics and hardware independence.

To someone accustomed to a command-line interface, Dataflex with its menus and function keys will seem a bit cumbersome at first, but it soon becomes easy to move around. There is a demonstration system available with an excellent 50-page tutorial manual that guides the new user, even a computer-illiterate one, through Dataflex's user facilities.

The Autodef program allows users to design a screen layout for a database file, then steps them through the procedure of setting that file up. Its presentation resembles that of Datastar. Its output is a prog-

"There are better ways of developing your applications" is the translation of these Portuguese-language cartoons, advertising Dataflex in Brazil.

ram source code file that can be compiled and run, and which will maintain the appropriate file.

The screen image is drawn up using any editor or word processor that can produce ASCII files. It is best not to use Dataflex's own editor; this atrocity is a real time-waster, lacking such fundamental features as cut-and-paste. Fortunately, any editor will do.

Once the file has been set up and populated, the Query program can be used to produce simple reports and lists. Query is idiotproof to the point of distraction. Not being structured around interactive commands, it is unable to accept such things as SELECT WHERE BIRTHDATE > "1-JAN-66". You much first bring up the screen for that record, advance to the BIRTHDATE field, hit a function key to indicate that you want to select on this field, advance to a field marked "greater than", and hit ENTER to indicate that you want the birthdate to be greater than something. Only then does the system allow you to type 1-JAN-66. If you make a mistake anywhere along the way, you must start all over again.

When all this is done, the system performs the selection and listing quickly and efficiently. It all works; it's just awkward.

Apart from the beginner's tutorial, the documentation contains a very useful, 14-page quick reference guide, and a thick manual. The manual contains lots of information, presented in a chatty and rather disorganised way and it also contains plenty of ridiculous marketing hype about how Dataflex is the best and the first and the unparallelled. The manual is indexed.

Error conditions in Dataflex generally produce English messages, but this is not always the case. If, for example, you try to run a Dataflex configuration but mis-type its name, Dataflex will simply fall over and you will get the operating system prompt. More seriously, I tried to use the Query program's facility that generates a program, so that I would not have to go through the lengthy selection specification the next time I wanted to run the query. The generated program seemed to compile without errors, but when I tried to run it the computer hung and had to be rebooted.

Summary

Dataflex cannot compete with the sophisticated database structures of Paradox, the fancy presentation of Reflex or the immense range of existing applications for dBase, but it has two features that none of the other database products can match: Dataflex was born to be multi-user, doing proper housekeeping when more than one person is using its kernel; and its appliations are portable across many types of computer and network hardware. In addition, its programming language is more powerful, if less friendly, than most.

Compared with multi-user operating systems, Dataflex cannot equal them in efficiency or, of course, in their ability to turn a single-user computer into a multi-user one. However, if used in conjunction with a multi-user operating system which (like UNIX and most of the networks) lacks its own database and application generator, Dataflex can provide both of these.

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Colourful performance from Japan

by John Lau

NEC, Japan's answer to the Big Blue, recently released its latest personal computer, the Advanced Personal Computer IV (APC IV), based on the 80286 microprocessor and thus IBM AT compatible.

This is the first move by the Japanese giant towards making one of its PCs IBM compatible. In the past, NEC has always maintained that it can do well in the PC marketplace based on its advanced technology and reputation (NEC is the world's largest manufacturer of semiconductor and world's third largest maker of personal computers). The APC III is one such example which, although it was the top selling PC in Japan, worldwide suffered a bit from being not IBM PC compatible. NEC acknowledged this and later brought out an optional card to enable the APC III to run IBM compatible software.

There had been a lot of media advertising that the APC IV meets the needs of (CPU) power (hungry) users who look for speed and advanced graphics. Let's take a closer look.

The reviewed system as supplied was an advanced graphics configuration comprising the base unit with one 1.2 Mb floppy, one 40 Mb hard disk, a keyboard and an advanced colour graphic monitor. You can pick this set up from one of NEC's dealers for $11,783.20 including GST, plus another $96.80 for MS-DOS version 3.11.

As usual, the whole package arrived in two big cartons weighing some 40 kg in total. On closer inspection, I found them to be firmly and securely packed and should withstand the abuse encountered during transportation. I was able to connect all the units together and got it booted up in less than ten minutes. Everything worked first time. My hard disk was loaded with an NEC APC IV demonstration package which informed me all about the parent company, its success and size, and went through to illustrate beautiful high resolution graphics in vivid colours. I could get a nice printout of a red Porsche 944.

System unit

The APC IV is based on Intel's 80286 microprocessor with 16-bit word length. It has a switch selectable clock speed of either fast 8 MHz or slower 6 MHz to ensure software compatibility. In performing this review I had the APC IV running at 8 MHz and found all programs to work satisfactorily. It has to be powered off

The colour and graphics are second to none.

before changing the clock speed to ensure that everything will work properly.

It comes with 640 Kb RAM as standard, and is expandable to 10.5 Mb in total, with up to 1 Mb on the motherboard itself and the rest on expansion boards at $666 each.

Other standard features that come with an APC IV are two serial ports (RS232 asynchronous full or half duplex capable of speed up to 9600 bps), one parallel port (Centronics interface) and provision for eight expansion slots, of which two are 8-bit full length slots and six 6/16-bit full length slots. Five internal storage peripheral slots are available to install a combination of hard disk, floppy disk and tape backup unit.

The Power Graphics Board costs $1756 and is compatible with IBM's Professional Graphics Adaptor (PGA). This board provides a resolution of 1120 by 750 pixels, and will be the choice for colour and graphics intensive applications. You can display 16 colours from over 4000 available (4096 to be exact). If you have both the Advanced and Power

Graphics cards, NEC provides an internal connection so that you do not have to mess about changing boards when running different software packages.

Calendar and clock with battery backup complete the package.

The fan as installed is much quieter than that used in NEC's APC III, and unobtrusive in most environments.

On the front panel to the left is located a security key lock which also operates as the system reset switch and physically locking out the keyboard. There is a green power-on status light to the right of the key and a red hard disk access indicator light.

In the middle section of the unit sits a half-height internal 40 Mb hard disk. On the right is located a half-height 1.2 Mb 5¼ in floppy drive, with provision for three more mass storage devices to be installed internally under the existing units. Disk access time is in the region of 40 msec average and works well and fairly quietly too. NEC provides a software utility to retract the head before powering off to ensure that it is not accidentally damaged by bumps and knocks.

Keyboard

The supplied keyboard is fully detachable from the plug at the rear of the system unit, although I found the fixed part on the keyboard end should be on either side of the keyboard or located underneath. As it is, you cannot push the keyboard right next to the system unit as you might have to do on top of a small desk or limited working space.

This is the first move by the Japanese giant towards making one of its PCs IBM compatible.

NEC claims, and I quote, "So compatible is the keyboard on the APC IV that the key caps are exchangeable." Need I say more?

I personally find the key action lacks a feeling of depth. The keys have a very short travel distance, but I suppose the speed typists would find they might be typing faster with this keyboard.

Display Options

The APC.IV supports three different color graphics cards, namely Color Graphics, Advanced Graphics and Power Graphics, and two 14-inch display monitors, Advanced Color and Power Graphics displays.

The Colour Graphics card costs $358 and offers a resolution of 640 by 200 pixels and is compatible with IBM's Color Graphics Adaptor (CGA). All the text manipulations like normal and reverse video, blinking, underscore, and bold can be done.

The Advanced Graphics Board at $936 is compatible with IBM's CGA and Enhanced Graphics Adaptor (EGA). This card provides a 640 by 350 pixel resolution. Up to 16 colours can be displayed at any one time from a palette of 64.

The 14 inch monitor that comes with the reviewed system is the Avanced Color display, with a resolution of 800 by 560 pixels. It has 25 lines by 80 columns and automaticlaly adjusts to horizontal frequencies of between 15.75 and 35 KHz. The vertical frequency can manually be switched to 50 or 60 Hz.

At the top of the monitor, hidden under a flap, are various control and status indicator lights. A text switch allows the text display to be set to various colours (the colour is selected by dip switches at the back of the unit). Then there are control knobs for brightness, contrast, vertical size, vertical hold, vertical position and horizontal position. A horizontal width switch allows the user to change the on-screen display size (only slightly). Status indicator lights are to show manual status (off for IBM compatible or on for non-IBM compatible), TTL status (TTL or analog input) and a green power on status.

The Test

During the last few days, I extensively tested the IBM AT compatibility claim by running numerous application packages and recreational software including Symphony. Lotus 123, Smart, Donkey Kong, Gato etc. Everything worked just fine. I connected up a modem and with Mirror Mirror communication package got talking to Compuserv database in America.

The colour and graphics were excellent. The machine performed flawlessly, and quickly too. I ran my benchmark tests using Symphony's spreadsheet to load, recalculate and save onto a floppy disk. The results are tabulated below and are compared with results obtained from IBM AT (6 MHz and 80287 co-processor). The spreadsheet was a 20 columns by 100 rows financial model.

Operations	IBM AT 6 MHz 80287	NEC APC IV 8 MHz
Booting up	29 sec	14 sec
Norton utilities Performance Index	5.7	7.7
Formatting 1.2 Mb	95 sec	73 sec
Spreadsheet		
Load	38 sec	28 sec
Recalculate	15 sec	12 sec
Save	75 sec	40 sec

Summary	
Name	APC IV
Manufacturer	NEC corporation, Japan
Processor	Intel Corp 80286
Speed	6 MHz/8 MHz
Memory RAM	640 Kb expandable to 10.5 Mb
ROM	64 Kb
Keyboard	84 keys plus 10 function keys
Mass storage	1 1.2 Mb floppy disk half height
	1 1.2 Mb floppy disk half height
Interface	2 TS232 serial ports
	1 parallel Centronics port
Monitor	14 inch Advanced Color
Resolution	800 by 560 pixels
System price	$10712 exluding GST
Options	80287 co-processor
	Memory expansion board Tape backup

Conclusion

There is almost nothing that I could quibble about with the APC IV. The colour and graphics are second to none. The power and speed are right up there with the very best. The expansion options will see you and your business grow. Everything works (and quickly too). All the software in the world for virtually every situation. You get the support of one of the largest computer and communications companies in the world. The price is right. What more could one ask for?

This has to be one of the best buys of the year.

Reviewed system supplied by NEC Information Systems in Auckland.

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MS-DOS programmes are aimed at the IBM-PC and close compatibles. The NEC APC III will often require the software library extension card to be able to execute these programmes.

Documentation is included on the disks where required — often it is very extensive. Unfortunately, we are unable to provide telephone tutorials on using the programmes.

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by Koos Baars

It has been written again and again: do not buy your microcomputer before you have selected the software for your own particular farm requirements. It might well be possible that your chosen software will not run on your favourite microcomputer!

Buying agricultural software is quite different from purchasing software for a business in town. There is not much software available from computer dealers that is dedicated to farm applications. This is because farmers are a small user group and suppliers of agricultural programs are scattered across New Zealand. You have to buy from these suppliers or their network of agents.

Forget about writing your own programs other than those for performing minor tasks. Programming is a specialist and very time-consuming job.

However, specialist programs have certain rigidities and constraints. The early users of farm computers still prefer spreadsheets and integrated packages for their farm applications. The advantages are versatility, intellectual satisfaction, less expenditure on software; and the disadvantage (?) the time required for setting up these systems.

A number of these early innovators like Phil Brown at Panetapu and Mac Hanna at Tokoroa have impressive financial and recording systems using spreadsheets and integrated packages. Of course it must be remembered that they had little choice at a time when virtually no specialist packages were available. This option is definitely not for the first time user.

Buying software should not be impulsive, but careful questions should be asked for each package or program that is required in the farm office. Let us consider a number of them:

1. What information do I want the program to solve?
2. Does the program require more information than I am willing to keep?
3. Will it allow me to enter all the information I wish to analyse?
4. Can the program be modified to meet my requirements, and if so, what is the extra cost involved?
5. How easy is the program to operate and how much training is included in the price?
6. Is a well-documented manual included?
7. Is there vendor support for the software?
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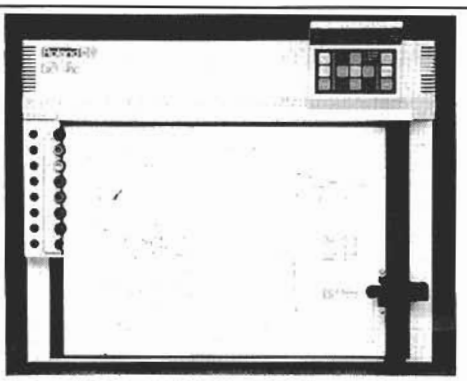

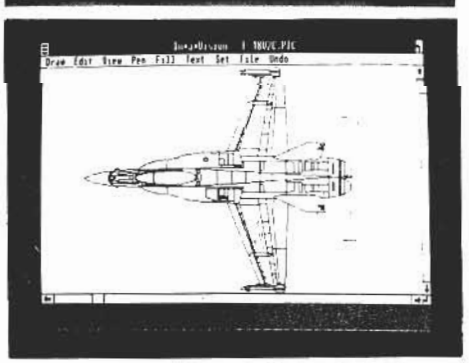

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Add your own questions. Other factors can be important. For financial software you will have to establish credibility and confidence with your accountant. Their or a consultant's requirements will have to be taken into account. You want to save money on GST and reduce your accountancy bill, so your visits to the accountant should change and concentrate on planning rather than adding up figures. Your accountancy bill should be less. Maybe you have to change your accountant!

You must add these considerations to your list. Think through more of your requirements. Say you want to buy a financial and a stock recording system. It is very helpful or maybe even essential for your farming operation that records on individual animals can be related to sales and purchases in the financial package. Can the individual animal records be used to extract data for use in a breeding or genetic improvement package or central database? Is stock reconciliation in the financial package possible using data entered in the animal recording system?

When buying animal recording packages you should ask if the possibility of linking to national recording schemes has or will be considered. A yes or no to these questions is important to some farmers, but unimportant to others. Compatibility of reports can also be a consideration. You have to check your own personal requirements, but do not forget they may even change over time. Try to anticipate farm developments or buy a system which allows for expansion.

I cannot emphasise too much the jotting down of additional checklists for your record keeping habits, input requirements, printed reports etc. Make your own list for what you require in printed reports. For example, can the reports be configured to your requirements?

Even speed of calculations is important, and you might get very annoyed about the time calculations take in some packages. There are significant differences between packages. Some allow for batch processing while you have a cup of coffee. This also applies to printing. Can you print everything you need later and save your reports initially to disk? Never forget that your investment on software will be considerable and finally outstrip the initial purchase price of your computer system. Regrettably we have not reached the situation yet where packages have been compared using evaluation checklists. And even if they were available it is up to you to make the final decisions on your requirements.

After you have written down your requirements, it is time to look around for the software to help you to achieve your aims. The main suppliers of agricultural software are listed below. Their software is definitely of good quality. Software from one of them may suit one farmer, but be less useful for another. Talk or visit other users of their software in the first instance, and finally get a demonstration. The Kellogg Unit also sells demonstration copies for 10 percent of the price.

There is far more software available, and an earlier summary was given by Dave McKinnon in the *NZ Farmer* of April 1985:Vol. 106, nr 8. However these six companies have a full range of programs or deserve mention because of specialist packages of high quality. Each offers training and support, and the first four companies have all been in existence for about four years. They have experience in the marketplace and a period of development behind them.

As can be expected from their reputation in the marketplace, their programs have been designed by farm management consultants, accountants, farmers and/or scientists (Decision Software).

The companies are:

1. Kellogg Farm Management Unit, Lincoln College, Canterbury.

The unit was established in August 1980 with financial assistance from

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the W K Kellogg Foundation in the USA. The unit also runs educational workshops for farmers and has been involved in computer awareness programs, and puts out a very useful regular free newsletter, as well as supplying a full range of financial and recording packages. The unit has been significant in introducing microcomputers to farmers, and has also been successful in promoting its software in the Australian market. They must have been an early proponent of the government's user pays principle, and as early as 1980 it was anticipated that the unit would finally become self supporting. Leaflets with information on the programs are available from the unit, and contact Dr Peter Nuthall for further information.

2. Yates Farmfax, Box 1147 Tauranga.

Yates sells a full range of farming packages, from financial and recording systems to a packhouse/coolstore management system in the horticulture area, and has an excellent stock recording system for sale, called Studfax. It can cater for sheep, deer, horses and any other stock type. The main attractions are very easy use with consistent use of keys, powerful pedigree routines, and very flexible file manipulation, as well as many other attractive features. Expensive though! They have support and training facilities in Tauranga in addition to telephone support.

3. Primesoft-Farmplan, 381 Parnell Road, Auckland.

This firm was formed in October 1985, following a merger between Tony Lissaman's Farmplan of Christchurch and Primesoft of Timaru. They have now established themselves in Auckland in pleasant Parnell, joining the flight north for more lucrative markets. Doug Hanna, one of the founders of Primesoft, wrote the award-winning Primesoft programs for VIC 20 and Commodore 64 computers.

In a previous issue of *Bits & Bytes* I emphasised the need for an integrated approach to farm computing. A truly integrated approach to business management on the farm was taken by Tony Lissaman in his FBMS farm business management system as early as 1980, and it has now been in existence for more than six years. His philosophy has always been that when data have been entered they must be able to be used throughout a total software system. His financial systems also allow customisation and expandability. With this highly commendable approach you can buy what you need and expand slowly. This company has to be considered if you want to take the integrated approach to on-farm computing. Their systems can also be used in horticulture.

They have a wide variety of programs for sale ranging from stock recording systems, linkage to scales programs to total business management systems and separate financial modules. Their programs are available for many brands of computers. Write to them for a comprehensive brochure, including printouts of reports and agents.

4. Daisy Computer Systems, P.O. Box 39035, Auckland.

This small company supplies financial and recording systems for dairying, deer and goat farming, with software being sold through the Businessworld chain of computer dealers. Acceptance by these IBM dealers indicates quality. No glossy brochures are available, but I do recommend that you have a careful look at their software or phone for a demonstration by them or one of their agents. All their software has on-line help facilities. They have shown foresight in their packages in possible links to databases and downloading to spreadsheets, while their user interfaces are quite advanced compared with other companies.

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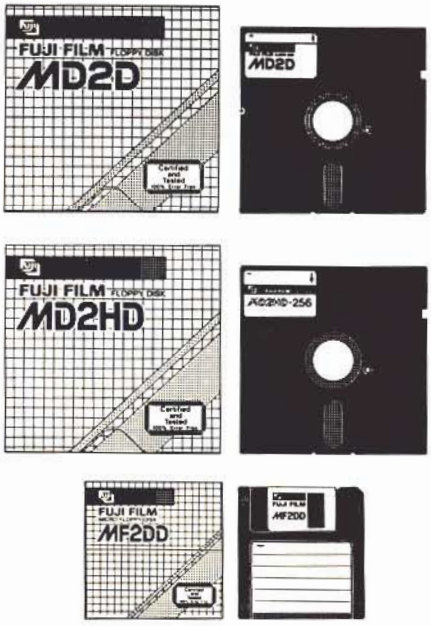

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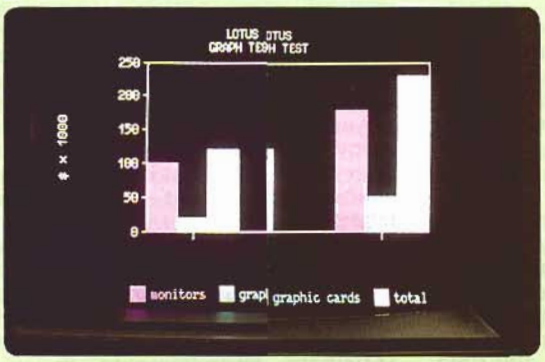

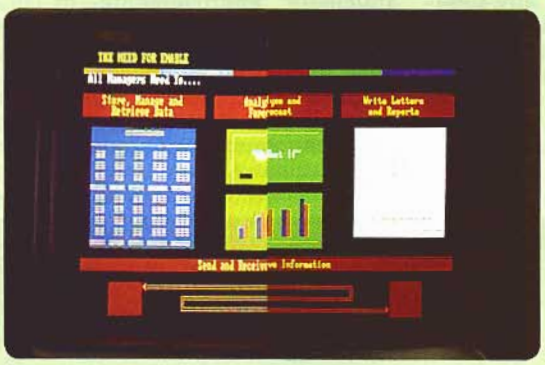

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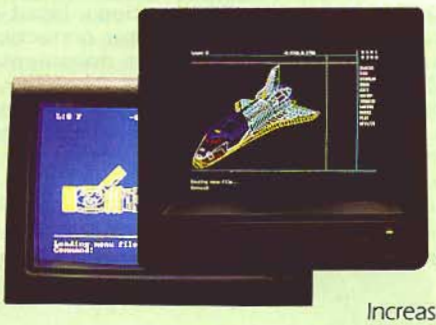

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5. Liveware Associates, P.O. Box 236, Taupo.

Deer and goat herd management information systems are supplied, and Liveware deserves a mention for software that is ideal for a first-time user and the occasional computer operator. User-selectable reports, weighing machine interface and a key analysis module are features of the systems. Documentation is very good indeed for first-time users.

6. Decision Software, P.O. Box 1312, Hamilton.

This is a specialist company which sells high quality pasture prediction (GROPAS) and feed budgeting software (BUDGIT). At this stage there is no other comparable choice for pasture and animal management software. This award-winning suite of programmes reflects the abilities and skills of Dr John Bircham, previously on agronomist at Whatawhata Hill Country Research Station. My only gripe is that I would like to see a more comprehensive manual to make clearer to a wide range of end users the considerable power and flexibility of BUDGIT. The approach is very innovative and if properly used will increase farm profits by better utilisation of the most basic farm resource: green grass. (The Ministry of Agriculture is also considering marketing of a highly advanced pasture predictor GRASS designed by the author of this article.)

Do not write off these packages or put them too low on your priority list. Financial recording and budgeting and animal recording systems may well show up or will finally reflect... the deeper lying causes of a poorer than expected financial and animal performance. In many cases they are directly related to your pasture and animal management.

There you are. The above companies have produced software of value and will give support costs. Software is not cheap. Make your checklists and visit other users before buying!

At some stage in on-farm computing I hope that we will have an agricultural software directory with details on hard and software requirements and evaluation checklists. These checklists should score each package for, say, user friendliness (on screen directions, input error checking, input error correction, any time exiting), user documentation, input format, report flexibility, output formats and internal documentation i.e. on-line help. Until this desirable development occurs you must make your own checklists, and visit neighbouring farmers who use computers, for more comments.

Regrettably you often require at least three months' use before you really know if all your needs are satisfied. This is impossible and impracticable, which is why you must seek assistance from other users until comparative software evaluations are done.

An alternative in some areas is a financial bureau service such as that offered by Wrightson NMA (Datayield). More elaborate bureau services using portable computers could offer a real growth and training path for many farmers, from teaching the data entry associated with packages to owning the required computer and packages. I do not know of many agricultural consultants who offer this service, but it would seem a useful development for many farmers.

There is still tremendous scope for further developments in agricultural software. System integration will be very important. It is still early days in on-farm computing, and we can anticipate improvements in user interfaces, better linkages between financial and animal recording systems, and larger databases.

These developments must lead to increasingly effective on-farm business management. They are essential in utilizing farm resources in the most efficient way. Make a start now!

Making full use of the technology

by John King

Rural computers are seen by the horitcultural sector in a different light from the pastoral side. The similarities in record-keeping and forecasting based on experience are there, of course, but horticulture is making increasing use of computerised mechanisation and the replacement of tedious manual bookkeeping by strategically-placed PCs.

"The industry itself is repetitive," says Steve Dohnt, a field service officer at the Kiwifruit Authority's Tauranga office. "It lends itself to computers. While the type of person involved in agriculture tends to be conservative and not inclined towards computers, the industry must have mechanisation of functions that are repetitive and open to error."

He estimates that 10 per cent of time is spent on error detection and correction, in an area where security is paramount when it comes to tracking the product through its many stages from picking, packing, freighting, storage, and final transport to overseas markets. The industry is small, with around 4,000 growers feeding 560 packhouses, 180 coolstores and seven exporters' agents, and because it is a free market the advantages of computerisation have to be shown as an incentive to the person going to do it.

"At the present time we have heaps of desktop micros," Dohnt points out, "with no compatible language and all fragmentation."

Out to change all that is David Penny, secretary of NZ Kiwifruit Exporters' Association Operations, in charge of developing what he describes as a de facto industry standard. The first stage of a sophisticated system for tracking pallets of kiwifruit through the various stages has been used through the 1986 season as a trial, and is generally reckoned to have been a success.

The basis is bar coding, nothing to do with gang patches and jeans in taverns, but those little strips of black on white background that can be read by light pens and similar devices, without the need for manually punching in data and all the attendant potential for error. In use in four selected static coolstore operating companies, as well as two stevedoring firms, have been 20 handheld Telxon microcomputers, chosen for their ruggedness for uncontrolled environmental conditions and their ability to interface with almost any other micro.

"It's basically restricted to the Bay of Plenty at the moment," explains Penny. "We've selected users more for the quality of management than size. This year has basically been a trial, and in the industry there is very little pressure necessary to get the job done right.

"We are aiming to establish standards in other areas, which is really a request from the software houses themselves. New Zealand is too small – especially in horticulture – to be able to afford a large content of materials. It's cost-effective to provide comprehensive packages to everyone's requirements. The idea is to make packages to a high level of intelligence, so the person responsible for capturing the information gets it right, complete and accurate."

The 1986 pilot programme has concentrated on tracking pallets into the coolstore, out to the wharf, through the stevedoring process and aboard the ship. Further development will take the process right back to the packhouse so that all aspects are covered, and expand it to include all users. Work was started on the scheme about August 1985 with the theoretical design finalised in November, all specifications finished by early 1986, and running in May, just in time to catch the start of the kiwifruit season.

"We went out early, looking for a horticulturist who likes computers"

"We've had the normal problems starting off," says Graeme Swan of Walker Datavision, the Auckland company responsible for the project software development. "There were interfacing problems, and also hardware, as well as the dumping of information into micros. But once operating, it's been running well, particularly when the fact that they've all been first-time computer users is taken into account. It's being used by untrained people, wharfies and the like, and is resaonably bullet-proof."

But keeping track of fruit after it leaves the packhouse is only part of the story. A complementary system to cater for orchardists themselves was put into operation last year and, like the kiwifruit arrangement, was originally conceived within the fruitgrowing industry which then approached an established electronics company.

Fruitfed initiated things with AWA (NZ) toward the end of 1983, and work began in July 1984 on the LYNX series. The name is something of a play on words, combining the idea of linking computers with the connotations of a fast cat.

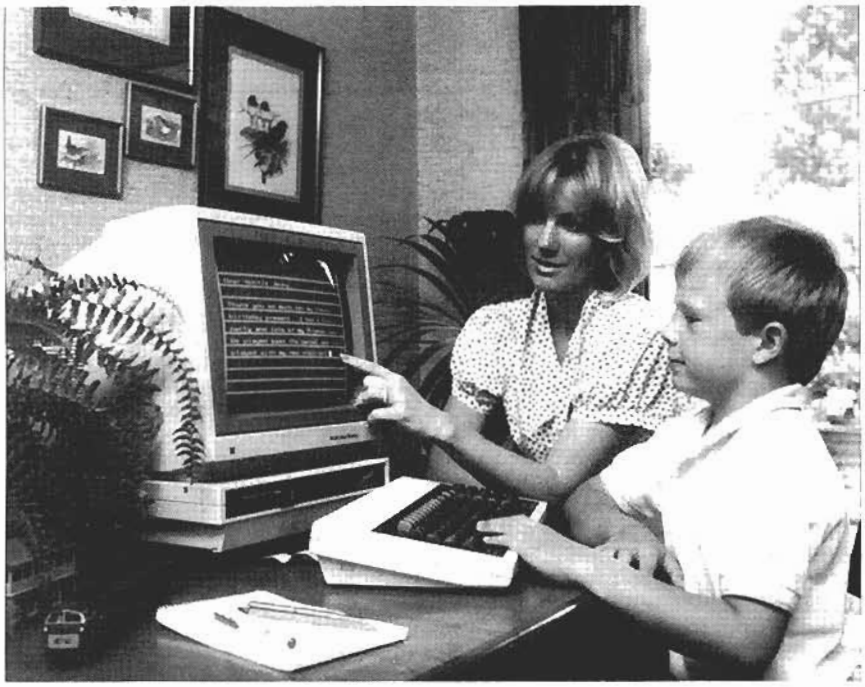
"We have three main systems," explains Robin Johansen, manager of AWA Systems Group. "There's LYNXsize for electronic weighing and grading; LYNXoffice, the general-purpose software for horticultural businesses; and LYNXclock, which has extra hardware added for the larger packhouse and can compute exactly the cost of each grower's work."

AWA standardised on the IBM PC compatible hardware for its capacity, and after the first version was up and running it went in search of somebody in the fruitgrowing industry to give it a thorough test. "We went out early, looking for a hotirculturist who likes computers," says Johansen. "We found John Williams, an apple grower near Nelson, and took him on as a consultant. He rounded the corners off."

Williams had originally bought himself a computer and, with no prior experience in such things, set out to write his own software for the orchard. By the time AWA found him, his payroll and general ledger systems had been through several generations and were running quite satisfactorily, and his testing of the LYNX series was comprehensive. That also applied to the hardware side of the operation, with electronic components being modified for reliability in the often dusty environment of the packing shed – not normally the place to find delicate microcomputers and their ancillaries.

LYNX office is offered as a complete package with all necessary hardware – including the 10Mb hard disk to contain the program – or as software only. It will work in conjunction with LYNXsize, a microprocessor-controlled sizing system which can be set for versatility of count sizes and packing stations. The result of development work by Millers Mechanical, the long-established Dunedin engineering firm recently bought by AWA and with an involvement in the electronic weighing systems for freezing works, it is admittedly not the first electronic fruit sizer.

"But the first generation of electronic graders didn't make full use of the technology," Robin Johansen points out.



Will the real BBC Master please stand up?

by Pip Forer

Acorn has come up with a new BBC micro, the Master Compact, aimed especially at lower budget applications and educational use in the younger years. It isn't portable, but is fast, very robust and repackaged in many ways. How does it rate in the market place and alongside its sister machines?

Given the stability of its operating system over the years (in this case a compliment to its design rather than an accusation of staidness) the BBC family of microcomputers has undergone several model releases over the last four years. Following the original model B came the Electron (a compromised model B), the B+ (an upgraded model B) and the Master 128 (the place the B+ was going before it got stopped on the way). Now, following better-than-expected sales of the Master in the UK comes the Master Compact. What does the Compact offer?

The logical place to start answering these questions is from the perspective of a potential buyer who is attracted by features of the whole Acorn family. The benefits and tradeoffs of the Acorn system have been discussed in many reviews, most recently in *Bits & Bytes* in the March 1986 Master 128 review. Since the operating fundamentals, but not the details, of the Master Compact closely parallel the Master 128, this review will examine what special features the Master Compact offers. In particular, is it a good first buy and how does it compare with the alternative of a Master 128?

Essentially the Compact is Acorn's attempt to provide a bundled machine with some enhanced design features. Physically it is a radical departure from all of its predecessors. It has a plinth design with separate keyboard, uses the fashionable 3½-inch disks, comes complete with built-in disk drive (with space for a second) and has its ports more sensibly arranged on rear surfaces (in D plugs) rather than on the underbelly of the main casing. In these respects it moves along two well-trodden paths of late: greater bundling of systems, and the separate keyboard.

Bundling goes beyond the disk drive. Along with the machine come two word processors (View and a children's word processor, ABC), plus Logotron/Acorn Logo, all of them on disk but downloadable to sideways RAM (where, for the newcomer to the BBC, they can be accessed instantaneously until the machine is turned off at day's end). From the choice of bundled items, and the more aggressive pricing strategy, it is clear that the Compact is particularly, but not uniquely, aimed at home use and the primary school market.

In this Acorn has certainly avoided one fatal pitfall. It is unlike the Electron and IBM-PC Junior, both of which were aimed at 'lower' markets but were so emasculated to avoid competition with their senior partners that they ended up hobbled for life. The Compact is *not* an attempt to fill a perceived lower-cost market with an artificially lower performance machine. The performance and configuration are fully equivalent to the Master 128 (in fact it is 10 per cent faster in BASIC). The operating system is identical, apart from some improved features, and software portability is assured, even where (as in time and date tracking) the full Master facility is not replicated.

In fact, the true relationship between the 128 and Compact is akin to that between the Apple IIe and IIc: design priorities have differed around an essentially standard system. The IIe/IIc split for Apple was not without its critics, and it may be worth asking whether Acorn really needed to produce the Compact.

On the physical side, the Compact certainly makes a more convenient and ergonomic unit. The plinth can support a heavy monitor with ease and can be positioned an appropriate distance from the user. For the two-disk drive user a slot in the casing allows a second drive to be housed within the main pedestal. The keyboard is a full Master 128 version with numeric keypad and function keys, and is very pleasant to the touch (but different from the 128). As mentioned, the cable slots are easier to reach. The disk operates quietly and the whole unit is extremely robust.

The only criticism of the design apparent on my review model would be that the keyboard is linked by two cables. One is a flat ribbon cable, which makes flexible movement of the keyboard less easy to achieve than, say, a round or spirally sprung cable. The other cable brings the power (5 volts) in from the plinth. This is a firm 'click' when linked up, but might be better witha real locking action, although to be realistic the power cable is longer than the (locked) ribbon one and a fair degree of perverse dexterity or classroom rioting would be needed to place stress on the power cable.

The limitations are that the RS423 for communications has become the cheaper RS232, and is also now optional, and there is no tube (so the Master 128's second processor upgrades are out; other options may well become available, however). The Editor and Terminal emulation ROMs go out the window, but in come several applications plus a sprite ROM. There are no 'cigarette tray' trapdoors into the BUS for interfaces and

ROMs as on the Master, but there is an edge connector into the bus for a similar expansion to the array of available peripherals. The old DFS disk filing system is not included, although you can still install it if you wish, but the enhanced ADFS is there. The 1MHz bus port has gone and the user and joystick ports have been merged into a single port labelled joystick/mouse.

Also missing is the battery-backed RAM that allows date and time to be kept by the 128 and handles configuring that system. In its place is a rewritable memory that emulates the date function (it is always midnight on the last day of 1999) and handles all the configuration options fully. Thus a user can preset the machine to come up in 80-column mode and View or 40-column graphics and LOGO if the set-up disk is inserted. The erasable memory that handles this reconfiguration (via a very simple control panel for the user) has an expected life of at least 10,000 reconfigures, enough at my rate of changes to last until well into the 23rd century.

From all of these comments it is clear that Compact and 128 are equal siblings rather than senior and junior: almost twins but not identical ones.

Faces for the user

Some effort has gone into making the system easy for the first time user. In this instance one suspects that the targeted first time user is either a primary/intermediate teacher of the parents of children in that age group. The Welcome disk that greets the user has a WIMPs front end (although without the mouse) featuring pull-down menus and icons. The software for this is tailored for use from the keyboard, joysticks or a mouse.

Insofar as it goes, it is par for the course and certainly makes it easy to get initially positive experiences on the Compact. Like most such cosmetic additions, however, it is a superficial add-on, rather than an integrated part of the operating system. However, Acorn has put the Icon ROM with the Compact and many of the OS calls make aspects of WIMPs application easy to handle. From this one can anticipate the emergence of new software employing mouse-oriented interfaces for different tasks.

The Welcome disk comes with a variety of useful tutorials and demonstrations. It also has Logotron Logo, which seems to have replaced Acorn's own larger Logo as company choice. This Logo has been consistently praised and has some very fine extension facilities and a floor turtle driver available through additional disks.

Also available is ABC, which is a primary orientated word processor with some interesting features. Not being a primary teacher I could not comment on ABC in any detail, but it allows lined pages and various simple formatting options using large, coloured text, easy to use with a couple of odd corners. View is also provided, which I have found a capable wordprocessor... and which my own kids have happily worked with.

The first session with the machine is easy. What about learning more? The Welcome Guide is shorter than the 128 guide (it has less to explain) and is augmented by a Logo tutor. There is also an optional reference manual and a lot of third party support material, some of which would

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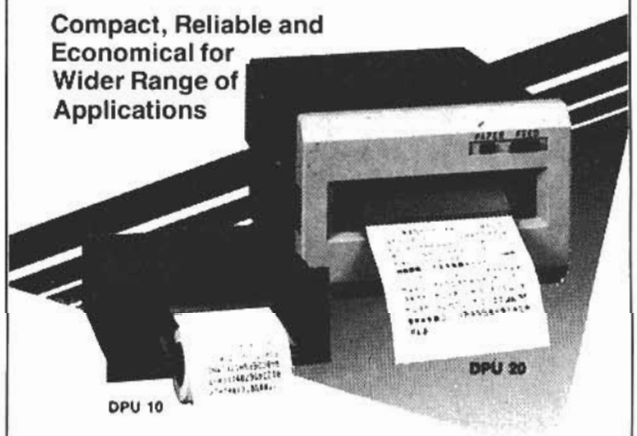

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be useful to the new user. Certainly the Welcome guide is *not* technical and the hacker user would need to get the reference manual associated with the machine straightaway (the ROM/RAM layouts are different from the 128 for a start). However, for many users this would not be a problem... and for those it might be there are good technical manuals available.

Would you buy the compact?

This depends on your evaluation of the BBC compared with other competition, and also on your evaluation of the Compact versus the Master 128.

If you are interested in machine performance, some interesting comparative benchmarks have been published lately. For running BASIC programs (using the *Personal Computer World* UK benchmarks) the compact is 10 per cent faster than the Master, twice the speed of the Electron, 50 per cent faster than Amstrad machines running the accelerated Mallard BASIC, between four and five times the speed of MSX and Atari 130s, and 70 per cent faster than the IBM-PC. In wordprocessing functions the Compact outperformed the Amstrad and the IBM-PC running Wordstar by an order of three.

For new users, the Compact is sufficiently like the rest of the family to say that if Acorn is on your list then the Compact should be considered. It is heir to all of the BBC software that the 128 has inherited, and has access to the very real advantages of Econet as a low cost but powerful network. Software should readily become available on the Compact since functionally the ADFS on large and small floppies is identical. It is even possible to have your second disk drive (externally) as a 5¼-inch one if you want to use software not available on 3½-inch.

Some effort has gone into making the system easy for the first time user.

Its advantages over the 128 depend on whether you wish to expand the system, get into serious programming or just potter and run existing educational and administrative software. For the non-hacker and non-programmer, the bundled software and physical configuration of the Compact offer an attractive alternative.

For existing BBC users the choice is less clear. I use the RS423 port and I program quite a lot, so the 128 would be my choice. The 128 must also be attractive to people wanting to use add-ons extensively (the ashtray ROM connectors are neater within the main machine, for instance). On a network the fact that the 128 can be diskless might be a significant saving (depending on how pricing evolves), and for communications freaks its internal modem is useful. The hacker may well want to upgrade to second processors as well.

However, many potential purchasers will be schools looking to get additional or replacement machines, especially with the trend to departmental stand-alone machines (a computer for science, one for geography, one for home economics). As a stand-alone where basically usage will be running existing programs, or doing small programs in BASIC, the Compact is attractive and cost-effective compared with the 128.

Of course the key factor is costing. Acorn is having to defend its educational markets, especially against Research Machines and Amstrad in the UK. As I write I am unaware of the final price of the Compact in New Zealand. I would like to be able to thank Alan Sugar of Amstrad for finally producing an innovative, cheap machine for education... by competing down

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the price of the Master Compact! Given the solidness of the Compact's construction, however, I doubt that it will be able to rival the cheapness of Amstrad and Commodore, but I hope it will come in at a level which keeps it attractive to the market it is aimed at.

Educationally it has a lot going for it, but to sell it must match the fearful lure of cheap PC clones and continue to offer cost and software availability over the nascent 16/32-bit WIMPs systems. It must also provide a competitive rival to the seductive cheapness of Amstrad machines, certainly the models which have had the greatest impact on Acorn's potential user base in elementary education in the UK.

Its design is such as to simplify the operation of the computer and minimise desk-top clutter. The bundling of the Logo and a simple word processor option plus View puts the two major user programs right out to market with the machine. These may seem minor changes, but in what is currently an important market they make the product that much more effective.

Review unit from Barson Computer (NZ) Ltd, Auckland.

Microcomputer Summary

Name	BBC Master Compact
Microprocessor	65C12
Clock speed	2MHz
RAM	128Kb plus 32Kb screen
ROM	64 Kb
Input/output	Parallel port, analog port, disk port, 4 channel sound, RGB, video and UHF outlets, 50-pin bus connector, optional RS232 and Network
Keyboard	Full 92 keys with numeric keypad. Editing and programmable function keys. All keys auto-repeat under software control. Type-ahead buffer.
Display	From 20 to 80 columns at 24 to 32 lines. Full teletext mode supported.
Operating system	BBC proprietary MOS and ADFS (DOS)
Languages	BASIC, Prolog, Logo, Pascal, Forth, Fortran and assembler options.
Graphics	Full bit-mapped graphics. Trade-offs feature 2 colours in 640 x 256, through to 8 colours in 160 x 256 pixels. Text and graphics intermix freely. Pallet selection supported and OS supports various graphics primitives.
Sound	4-channel with individual control on pitch, volume, envelope etc.
Peripherals and software	Compatible with virtually all existing BBC peripherals plus software.
Cost	$2195 basic model, $2508 monochrome, $2888 colour. Prices include GST.
Strengths	Ruggedness, speed, software base, elegant environment for computer learning, pure graphics, peripheral choice,network, proven track record, ability to plug in and go.
Question marks	Cost

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THE TYPE UTILITY: Part 3
A single-character INPUT subprogram

by Evan Lewis, Ph.D.

In Parts 1 and 2 a BASIC program designed to read sequential files and display their contents on the screen or printer was described, utilising the function keys of the Commodore 64. A special subprogram was also provided to replace the use of the INPUT statement for single character entries which do not require the RETURN key to be pressed after the entry. These two features are described here.

The reader may feel that the program would be simpler to use if the same function keys were used throughout, rather than using two different input techniques for setting up the initial mode of operation and for dynamically changing the mode once the program is running. But the question/answer method provides a user-friendly approach to getting the program started without external documentation. It also provides us with an opportunity to compare the two methods for use in future applications.

The use of function keys provides the most compact section of BASIC code (lines 555 to 600 in the listing of the TYPE utility). A simple GET statement is used to get a single character from the default input device i.e. the keyboard. If no key has been pressed, the string obtained (qq$) is empty and the rest of the function-key code is skipped.

Otherwise we determine the ASCII code number of the key pressed by using the ASC function. In the case of the commodore function keys the resulting codes are:
F1=133, f3=134, f5=135, f7=136,
f2=137, f4=138, f6=139, f8= 140.

This peculiar order means that we have to devise a special method to convert the character codes into the numbers 1 to 8 corresponding to the eight function keys. The following code does the conversion:

```
f%=(asc(qq$) – 132) * 2 – 1
if f% > 7 then f%=f% – 7
```

If some key other than a function key had been pressed, invalid and usually negative values for f% result. These are treated as invalid entries and are ignored.

The ON... GOSUB or ON... GOTO statement can now be used to pass control to an appropriate section of the program. The use of ON... GOSUB is usually the tidiest solution and the appropriate sections of code should be written as self-contained subprograms.

The ON... GOSUB... statement includes a counter or index (after ON) which indicates which subprogram is to be executed. In this case the function key number (f%) is used. If the index is 1 then control is passed to the first line number in the list following GOSUB; if the index is 2 then the subprogram at the second line number is used and so on. If the index exceeds the number of entries on the list then the next statement in the program after the ON... GOSUB is executed instead, as though an empty subprogram had been used.

Remark statements can be used to indicate the name of the subprogram corresponding to each line number:

```
rem        f1,   f2,   f3,   f4
rem        wait, cont, scre, print
on f% gosub 630, 625, 330,  345
```

Thus if the f3 key is pressed to select output to the screen, the calculated value of f% is 3, the subprogram at line 330 is executed, and when it has run to completion control is returned to the next statement in the program following the ON... GOSUB.

If key f1 is pressed the program stops execution until any key is pressed. This is achieved by the subprogram

```
630 wait 198,1: return
```

which stops the program until memory location 198 contains the number 1 rather than zero. Since 198 is the keystroke counter for the keyboard buffer it is changed to 1 as soon as a key is pressed and the main loop resumes execution. But the key is not removed from the buffer, so on the next pass through theloop the key which was pressed is read from the buffer by GET qq$.

Thus if f1 is pressed repeatedly the loop executes one cycle at a time – once for each time f1 is pressed. Each time it is pressed another cycle is executed but the WAIT prevents it from going on to the next cycle until f1 is pressed again. (The vicious cycle can be broken by pressing some other key, e.g. f2.) The statement

```
530 poke 650, 128
```

causes all keys to repeat when held down which means that the program will continue execution as long as the f1 key is held down.

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The initial settings of the various input/output options in the TYPE utility are set up using a subprogram to simulate an INPUT statement with special features. This subprogram may be of general use in writing other programs, and many experienced programmers keep a collection of similar general purpose subprograms on a special disk or tape to allow rapid assembly of new programs using pre-existing subprograms.

To streamline the question and answer process the user should only have to press a single key to make his choice. If the wrong key is pressed there should be no response – giving the impression that the key is not functioning. Standard answers should also be provided so that if the user presses the RETURN key after each question a sensible and commonly used answer is automatically provided by the program. This is known as the "default" value of the option. The letter representing the default value should be displayed to the user.

If, for example, the user is asked

"screen or printer output (s/p)"?s,

'p' can be entered to produce printed results, or more commonly 's' can be selected for output to the screen. But 's' is already set up as the default, so if the RETURN key is pressed the effect is the same as entering 's' for screen output. For standard operation of the program the user can rapidly press RETURN after every question.

A subprogram is provided at line 820 (see also 765-820) to meet these specifications. Before the subprogram is called, a string of valid single-letter responses is set up as qv$. In the above example qv$="sp" as in lines 305-310, ('s' for screen, 'p' for print). After the subprogram has been called the user's answer is stored in qq$ and can be transferred for permanent storage into another variable, e.g. out$=qq$ to record the method of output required.

The requirements selection subprogram (lines 245-325), asks for the name of the file to be examined and then uses the above technique to ask six questions.

The first job is to set up several single character strings which may be used several times. These include back$ representing the cursor left character, cr$ representing the carriage return (i.e. RETURN) key, and qd$ containing the default entry.

The question itself is set up by the program which calls the subprogram, but the question mark and default letter are displayed by the subprogram. Cursor left (back$) is used to cause the cursor to flash over the default entry.

Characters entered by the user are obtained by GET qq$ (line 850). If qq$ does not contain a valid character the GET statement is repeated in a loop until an entry is made.

Although the normal cursor flashing can be turned on by poke 204, 0 on the Commodore 64, it is difficult to control and a simulated flashing generated by BASIC code is preferred. Flashing is achieved by counting how many times the loop has been executed (using q1%). When the counter reaches 6 the default character is displayed in reverse video and the counter is reset to 0 (line 860). When it reaches 3 again the same character is printed without reverse video and so on.

If the GET statement detects that RETURN has been pressed, the reply string qq$ is given the default value qd$. Otherwise a loop is used to compare the character entered (qq$) with each character in the valid entry string (qv$). If a valid character is not found, the GET statement is executed again. If the entry is valid, its numerical value qq is found, and if it was y for yes a flag q% is set to true (represented by –1 in Boolean logic).

Notice that FOR/NEXT loops are not used here because we wish to jump out of the loop before it is completed. If that were done repeatedly with a FOR loop it would eventually cause an OUT OF MEMORY ERROR. That occurs because the machine records in the stack where the beginning of the loop was. When the loop is completed the stack entry is removed. If the loop is not completed normally it remains in the stack which is limited to 256 bytes of memory and eventually (after 23 uncompleted loops) the stack is filled up causing the error.

Some useful tricks in Boolean logic are used in this program. It has already been mentioned that qq% is set up as true (–1) if y is entered and false (0) otherwise. This allows the "get character" subprogram to conveniently handle yes/no type answers. After setting qv$="yn" and executing the subprogram, q% can be tested in an IF statement, e.g.

```
IF q% THEN PRINT "YES WAS
   ENTERED"
```

Notice that q% is used in place of a logic expression since it has already been assigned a value of true or false. Only if q% is true (i.e. non-zero) is the PRINT statement executed.

A more complex case occurs at line 300 where as% is set up as true or false by assigning it to a logical expression. The part in brackets is the same as an expression used in an IF statement. Actually the brackets can be omitted and

```
as% = qq$ = "a"
```

is a valid expression! If qq$ is equal to "a" then as% is given the Boolean value of true, i.e. as%=–1. If qq$ is not equal to "a" the expression qq$="a" is false which is represented by 0 so as%=0.

Now as% can be used repeatedly in IF statements without re-evaluating the logic expression qq$="a". Thus at lines 505 and 615 instead of writing

```
IF qq$ = "a" then...
```

we write

```
IF as% then...
```

These logic variables which are either true or false are often referred to as "flags" which are either "set" or "cleared".

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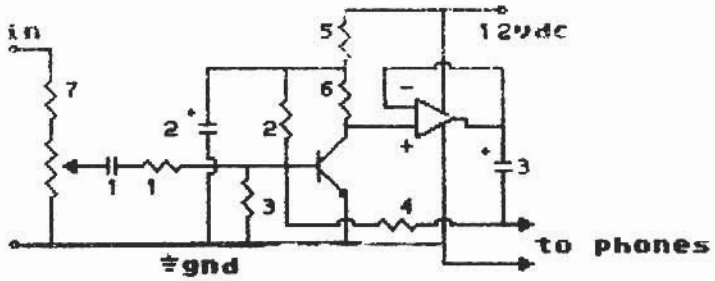

R1	100K	C1	0.1uF
2	560K	2	47uF
3	68K	3	100uF
4	1M	IC1	LM741
5	27K	TR1	BC548
6	27K	VR1	10K Log
7	47K		

by Joe Colquitt

The Commodore can be used for many audio and video applications in addition to the straightforward things that everybody thinks of. One that users may have overlooked is the titling of video cassettes, while bit-map programs such as Printshop and Doodle, which allow large lettering for the extra effect in layout, can be used to write directories and indices for completed video tapes.

Although many TVs and monitors have good audio systems, quite often they can't reproduce the range offered by the 64's SID chip, because of the small speaker. Notably lacking is a good bass sound. As a bass player, I know all the gripes about treble instruments dominating, so at home, I plug the computer into the stereo and crank the bass up.

Unless you've heard the 64 through *a set of decent speakers, you don't* know what you're missing. Games take on a whole new dimension. Some programmers really take a lot of trouble with their sound, and I feel I should go to the trouble of hearing it properly. Also, if you're a games all-nighter, you can stick the headphones on.

Connecting the 64 to an amp is so simple, I'm surprised that more people don't do it. All that's needed is a 5-pin DIN plug for the computer end, and an RCA for the other. This plugs into a TAPE or AUX input. If you have a guitar amp lying around, substitute a ¼" jack for the RCA plug.

A complication arises if you have a newer 64 model, which has an external video modulator that plugs into the 'audio out' socket. What you would have to do is make a Y-connector, in order to get access to the 'audio out' pin. Geriatric models like mine have an internal modulator that doesn't use the 'audio out' socket, and connectors can plug in directly. The older models also have the facility for plugging instruments INTO the 64, something I had a great deal of fun with. Check out Appendix O in the User Guide, p472.

If you don't want (aren't allowed) to use the stereo, there are several low wattage amp chips around that can be used as stand-alone amplifiers. A particularly efficient one is the Motorola 2002AV which puts out 7W on a 12V supply. If you look around, you should be able to get hold of an 8", 10" or 12" speaker, perhaps out of an old cabinet TV or radiogram. (Mucos will probably want to aim for *a JBL K140 in a double reflex enclo*sure with piezo-squawkers for the top end.)

Below is a circuit for a headphone amp, that takes up no room at all. One of these days, I'll permanently install one in my 64. It uses very little power (6mA), but will drive most headphones quite loud. Gain is controlled by VR, or by altering the feed-back resistor R4. The 12V is a nominal voltage, and can be anywhere between 5 and 35 volts DC. If you have any instability problems, see a psychiatrist or try a 1000uF capacitor between the supply voltage and ground.

Commodore put sockets on their machines to plug things into, so don't be afraid to have a go.

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PROGRAM SPECIAL

Introduction by Joe Colquitt

The following programs, and those in future issues, are the handiwork of various authors using various machines, and kudos to them for taking the time to put something together. However, there must be at least as many programmers around who may have considered contributing, but thought their efforts weren't good enough. The idea is, of course, to send it in and let US tell you it's no good.

Seriously, though, a lot of good ideas, simple or otherwise, can be made quite presentable with just a little bit of time and consideration for the end user.

What we are able to publish depends on what readers send in to us. All types are being received, but there is a noticeable trend towards utility programs. The reason may be that so many game programs are around these days that fewer people can be bothered writing games, or typing them in from listings.

If you do submit a listing, the preferred format is 40 columns wide, which reduces well into a text column, and the easiest way to achieve this is with a word processor, not forgetting a nice black ribbon in your printer. We still require programs, in particular short programs for the more popular computers. Many of those received are simply too long to print, and some readers can't be bothered typing in your 10-page program, masterpiece though it may be!

And on a more general note, I suggest that instead of gluing yourself to a chair, brain-drained by that flickering box in the corner, you should take time out to finish a project. It's bound to be useful, and could even earn you spare cash. I mean, how many other products can you sell and yet still keep?

One of the problems of writing software for the general market is that there is so much competition from overseas. Admittedly, American and British software houses have larger resources to call on, as far as marketing and financing go, but fundamentally one program is written by one brain, and I think most programmers consider themselves unique individuals.

Although some New Zealand software companies have made extraordinary progress into local markets, the country as a whole could not be considered as an exporter. Local talent is being used to obviate the need to import. Among the companies using local software is one which leads the world (by years) in futures and stock market interfacing. Indigenous EFTPOS systems, railway-engine black boxes, database management, and a diversity of applications abound.

"I couldn't do that," you say, as the magazine drops from your nerveless fingers. That may be true, but there are plenty of places to start making inroads into the commercial market. I write software for a finance/insurance company. That came about because I'd been running databases for local shops on a Commodore 64, a video shop that needed film lists updating, a couple of balance sheets, and a smidgen of printing. Word of mouth got around, and I've a regular supply of work using PCs.

The company is now using an office system that saves time, money, paperwork and is portable. The software isn't flash, but it's efficient, and the firm can call on me for modifications, which may not be possible with proprietary software.

Why don't you have a look around where you live and see what you can do for people in the area? Sort of bob-a-job. Even if some of the work may be beyond you at the time it is proposed, don't let that put you off. Give yourself a shove and soldier on. It's the only way to go forward, but don't outpace your capabilities. Just try to gradually increase your skill and, at the same time, your output. Incidentally,where are all the lady programmers? Right! Get on with it!

SPECTRAVIDEO

Happy Birthday

by Garry Clark

"Happy Birthday" is played and a cake drawn, complete with candles and comments. Extra birthday comments can be added between lines 440 and 500, while program lines 260, 270, 290 and 610 print special graphics symbols. These are programmed by pressing the Right Graph key at the same time as the letter indicated in the REM statement. Line 510 turns on the drums, which are played under the third channel in line 540.

```
10 REM HAPPY BIRTHDAY
20 REM Garry Clark
30 STOPON:ONSTOPGOSUB680
40 COLOR 15,4,5:SCREEN0,0:LOCATE6,0
50 PRINT"H A P P Y    B I R T H D A Y"
60 PRINT:PRINT
70 INPUT"Whose BIRTHDAY is it ";N$
80 L=LEN(N$)
90 IFL>13THENPRINT"Too long":PRINT:BEEP:
GOTO70
100 PRINT:INPUT"A G E  at  birthday  ";B
:A=B
110 COLOR15,4,1:SCREEN1:BEEP
120 REM CAKE
130 LINE(0,85)-(255,130),10,BF
140 CIRCLE(128,130),128,10,,,.3
150 PAINT(128,131),10
160 CIRCLE(128,80),128,11,,,.3
170 PAINT(128,45),11
180 REM CANDLES & LOOP
190 PLAY"T255","T255","T255"
200 IFB< ITHEN B=1
210 IFB>35THEN B=35
220 IFA>79THEN PLAY"T140","T140","T140"
230 C=INT((254/B)/2)+5
240 FORD=1TOB
250 LINE(C,80)-(C+5,20),15,BF
260 LOCATEC,17:PRINT"*"  *=Right Graph N
270 LOCATEC,74:PRINT"*"  *=Right Graph H
280 COLOR 9
290 LOCATEC,7 :PRINT"*"  *=Right Graph N
300 SOUND9,15:SOUND2,170-D*4:SOUND9,0
310 C=C+INT(254/B):COLOR15:NEXTD
320 REM WORDING
330 L=LEN(N$):C$=""
340 FORZ=1TOL:B$=MID$(N$,Z,1)
350 C$=C$+B$+"  ":NEXT
360 FORY=1TO2:FORX=1TO2
370 LOCATE45+X,170+Y
380 PRINT"H A P P Y    B I R T H D A Y"
390 LOCATE128+X-L*9,183:PRINTC$
400 NEXTX,Y:COLOR1
410 REM PLACE YOUR COMMENTS
420 IF A)35 THEN LOCATE25,85:PRINTN$;" y
ou need a larger Cake!"
430 IF A>109THEN LOCATE20,95:PRINTA;" WO
W..the Guiness book for you":GOTO500
440 IF A>99 THEN LOCATE35,95:PRINT"The Q
een will send a telegram."
500 REM MUSIC Happy Birthday
510 SOUND7,220:SOUND6,3:'Channel 3 Drums
520 PLAY"M250@5L8FFL4GFB-L2A L8FFL4GF05
[illegible]
530 PLAY"M250@5L8FFL4GFB-L2A L8FFL4GF
06CL205B- L8FFL406FD05B-AG L806E-E-L4D05
B-06C05B-R","M250@06S3L8RRL4RRB-AR L8RRL
4RF07CL206R L8RRL406RR B-AR L807E-E-L4R"
540 PLAY"M400@5L8FFL4GFB-L2A L8FFL4GF05
[illegible]
[illegible]
550 IF(PLAY(1)+PLAY(2))=0THEN570
560 GOTO550
570 FORT=1TO1000:NEXT:SOUND13,6:SOUND12,
20:SOUND7,247:SOUND8,16
580 FOR T=1TO500:NEXT:BEEP
590 FOR D=8TO1STEP-1
600 C=C-INT(254/8):COLOR4
610 LOCATEC,7:PRINT"*"  *=Right Graph N
620 SOUND9,15:SOUND2,170-D*4:SOUND9,0
630 NEXTD
640 COLOR15
650 K$=INKEY$:IFK$=""THEN650
660 IFK$="E"ORK$="e"THEN680
670 GOTO180
680 COLOR 15,4,5:SCREEN0,1:END
```

Piano

by David Knowles

The computer keys are turned into piano keys.

```
READY.
1 REM PIANO
2 REM FROM A TO INST DEL KEY
3 REM FOR THE 128
4 REM BY DAVID FRANKS
5 K=0
6 SCNCLR
7 GETKEYA$
8 IFA$="W"THENPLAY"03C"
9 IFA$="E"THENPLAY"03D"
10 IFA$="R"THENPLAY"03E"
11 IFA$="T"THENPLAY"03F"
12 IFA$="Y"THENPLAY"03G"
13 IFA$="U"THENPLAY"03A"
14 IFA$="I"THENPLAY"03B"
15 IFA$="O"THENPLAY"04C"
16 IFA$="P"THENPLAY"04D"
17 IFA$="@"THENPLAY"04E"
18 IFA$="*"THENPLAY"04F"
19 IFA$="↑"THENPLAY"04G"
20 IFA$="←"THENPLAY"04A"
21 IFA$="["THENPLAY"04B"
22 IFA$="2"THENPLAY"05C"
23 IFA$="3"THENPLAY"05D"
24 IFA$="4"THENPLAY"05E"
25 IFA$="5"THENPLAY"05F"
26 IFA$="6"THENPLAY"05G"
27 IFA$="7"THENPLAY"05A"
28 IFA$="8"THENPLAY"05B"
29 IFA$="9"THENPLAY"06C"
30 IFA$="0"THENPLAY"06D"
31 IFA$="+"THENPLAY"06E"
32 IFA$="-"THENPLAY"06F"
33 IFA$="£"THENPLAY"06G"
34 IFA$="(HOME)"THENPLAY"06A"
35 IFA$="(DEL)"THENPLAY"06B"
36 IFA$="A"THENPLAY"01C"
37 IFA$="S"THENPLAY"01D"
38 IFA$="D"THENPLAY"01E"
39 IFA$="F"THENPLAY"01F"
40 IFA$="G"THENPLAY"01G"
41 IFA$="H"THENPLAY"01A"
42 IFA$="J"THENPLAY"01B"
43 IFA$="K"THENPLAY"02C"
44 IFA$="L"THENPLAY"02D"
45 IFA$=":"THENPLAY"02E"
46 IFA$=";"THENPLAY"02F"
47 IFA$="="THENPLAY"02G"
48 IFA$=CHR$(13)THENPLAY"02A"
49 IFA$="Ø"THENPLAY"02B"
50 GOTO7
```

Pie Man

by Robert Boere

The idea of this game is to catch the falling pies with the pie van. The difficulty can be altered by changing the variable "Y1" in line 30020; if the number is decreased the game is made easier, and vice versa.

```
READY.
10 PRINT"{CLR}":NO=1:SC=0
20 POKE53280,6:POKE53281,0
30 PRINT"{C/DN}{C/DN}{GRN}                    PIE MAN"
40 PRINT"{C/DN}{C/DN}          BY ROB & MARK BOERE"
50 PRINT"{C/DN}{C/DN}{C/DN}{C/DN}{YELO}    USE THE JOYSTICK TO CONTROL THE"
60 PRINT"{C/DN}               PIE VAN, AND TRY"
70 PRINT"{C/DN}        TO CATCH THE FALLING PIES."
80 PRINT"{C/DN}{C/DN}{C/DN}{GRN}        {RVON} PRESS SPACE BAR TO START {RVOF}"
90 GETA$:IFA$<>" "THEN90
100 PRINT"{CLR}":POKE53281,0
105 POKE53265,PEEK(53265)AND239
110 FORX=1864TO2023
120 POKEX,224:POKEX+53272,5
130 NEXT
132 POKE53265,PEEK(53265)OR16
135 V=53248:POKE2042,13
136 FORN=0TO62:READQ:POKE832+N,Q:NEXT
140 POKE2041,14:FORN=0TO62:READA:POKE896+N,A:NEXT
5000 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,127,255,240,127,254,16
5010 DATA113,70,16,117,94,16,113,78,16,119,95,254,119,71,254
5020 DATA127,255,254,127,255,254,127,255,252,7,0,56
5030 DATA0,0,0,0,0,0,0,0,0,0,0,0
5040 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,6,0,0,233,0,1,16,128,2,0,64,15
5050 DATA255,224,4,0,64,2,0,128,1,255,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
```

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Texter

by Russell Smith

Intended primarily for an IBM with monochrome adapter, this program is a picture drawing utility for plotting any characters on the screen in any of the 12 different colours (or shades) available. It can be used for drawing graphs, charts, pictures etc, which can be loaded and saved.

```
10 ' ******************************
20 ' :  TEXTER - By Russell Smith.  :
30 ' :                              :
40 ' :       Version 1.11           :
50 ' :                              :
60 ' :     Soft Arts !985           :
70 ' ******************************
100 '
110 '
120 '
130 'SET UP THE SCREEN, VARIABLES etc...

140 '
150 SCREEN 0,0,0 : COLOR 7,0,0 : CLS : K
EY OFF : GOSUB 1610
160 SCREEN 0,0,0 : DEF SEG : POKE &H5B,1
 : POKE &H5C,24 : DEF SEG= &HB000 : COLO
R 7,0,0 : CLS : KEY OFF
170 FALSE=0 : TRUE=NOT FALSE : X=40 : Y=
12 : COL$="1" : JM=FALSE : IM=FALSE : KM
=FALSE : MM=FALSE
180 LOCATE 25,1,0 : PRINT "COLOUR  1"
190 GOSUB 1470
200 GOSUB 1510
210 '
220 ' MAIN LOOP - Get keys, Goto subrout
ines, and Print characters
230 '
240 PA=((Y-1)*160)+((X-1)*2) : CA=PEEK(P
A+1) : POKE PA+1,240
250 K$=INKEY$ : IF K$="" THEN GOTO 250
260 POKE PA+1,CA
270 IF LEFT$(K$,1)<>CHR$(0) THEN GOTO 45
0
280 FL=0 : Z$=CHR$(0)
290 IF K$=Z$+"H" THEN Y=Y-1 : FL=1 : IF
 Y<1 THEN Y=24
300 IF K$=Z$+"P" THEN Y=Y+1 : FL=1 : IF
 Y>24 THEN Y=1
310 IF K$=Z$+"M" THEN X=X+1 : FL=1 : IF
 X>80 THEN X=1
320 IF K$=Z$+"K" THEN X=X-1 : FL=1 : IF
 X<1 THEN X=80
330 IF FL=1 THEN GOTO 240
340 M=ASC(RIGHT$(K$,1)) : IF M>119 AND M
<132 THEN GOTO 710 ' Get color
350 IF M > 83 AND M < 114 THEN K$=DK$(M-
84) : GOTO 460     ' Defined keys
360 IF K$=Z$+CHR$(16) THEN GOTO 810    '
Quit
370 IF K$=Z$+CHR$(18) THEN GOTO 910   ' E
rase
380 IF K$=Z$+"!" THEN GOTO 1000        '
Filer
390 IF K$=Z$+CHR$(25) THEN GOTO 1400   '
Palette
400 IF K$=Z$+CHR$(32) THEN GOTO 1540   '
Key definer
410 IF K$=Z$+CHR$(37) THEN KM=NOT KM : G
OTO 240 ' K Move toggle
420 IF K$=Z$+CHR$(50) THEN MM=NOT MM : G
OTO 240 ' M Move toggle
430 IF K$=Z$+CHR$(36) THEN JM=NOT JM : G
OTO 240 ' J Move toggle
440 IF K$=Z$+CHR$(23) THEN IM=NOT IM : G
OTO 240 ' I Move toggle
450 IF LEFT$(K$,1)=CHR$(0) THEN GOTO 240

460 C$=COL$ : GOSUB 520 : POKE PA,ASC(K$
) : POKE PA+1,CC : IF IM=0 AND KM=0 AND
MM=0 AND JM=0 THEN GOTO 240
470 IF KM=TRUE THEN K$=Z$+"M" : GOTO 270

480 IF MM=TRUE THEN K$=Z$+"P" : GOTO 270

490 IF JM=TRUE THEN K$=Z$+"K" : GOTO 270

500 IF IM=TRUE THEN K$=Z$+"H" : GOTO 270

510 GOTO 240
520
530   A subroutine to decipher user sym
bols
540 '
550 FL=0 : IF C$="1" THEN CC=2 : RETURN
560 IF C$="2" THEN CC=1 : RETURN
570 IF C$="3" THEN CC=10 : RETURN
580 IF C$="4" THEN CC=9  : RETURN
590 IF C$="5" THEN CC=130 : RETURN
600 IF C$="6" THEN CC=129 : RETURN
610 IF C$="7" THEN CC=138 : RETURN
620 IF C$="8" THEN CC=137 : RETURN
630 IF C$="9" THEN CC=112 : RETURN
640 IF C$="0" THEN CC=120 : RETURN
650 IF C$="-" THEN CC=240 : RETURN
660 IF C$="=" THEN CC=248 : RETURN
670 FL=1 : RETURN
680 '
690 ' A subroutine to get the color
700 '
710 LOCATE 25,9,1
720 IF MK129 THEN COL$=RIGHT$(STR$(M-119
),1)
730 IF M=129 THEN COL$="0"
740 IF M=130 THEN COL$="-"
750 IF M=131 THEN COL$="="
760 LOCATE ,,0 : COLOR 7,0 : PRINT COL$;

770 GOTO 240
780 '
790 ' A "Do you want to quit?" subroutin
e
800 '
810 PLAY "L405D"
820 M=SCREEN (25,9) : COLOR 7,0 : LOCATE
 25,1,1 : PRINT"Do you really want to QU
IT?  Y/N ";
830 A$=INKEY$ : IF A$="" THEN GOTO 830
840 IF A$="Y" OR A$="y" THEN GOTO 860
850 LOCATE 25,1,0 : PRINT"COLOUR
                          "; : LOCATE 25,9,0 :
PRINT CHR$(M); : GOTO 240
860 COLOR 7,0,0 : CLS : PRINT"Goodbye ..
.." : PRINT : PRINT : PRINT
870 GOTO 1480
880 '
890 ' A "Do you want to erase this?" sub
routine
900 '
910 PLAY "L405D
920 M=SCREEN (25,9) : COLOR 7,0 : LOCATE
 25,1,1 : PRINT"Do you really want to ER
ASE this?  Y/N ";
930 A$=INKEY$ : IF A$="" THEN GOTO 930
940 IF A$="Y" OR A$="y" THEN GOTO 960
950 LOCATE 25,1,0 : PRINT"COLOUR
                          "; : LOCATE 25,9
,0 : PRINT CHR$(M); : GOTO 240
960 CLEAR : GOTO 160
970 '
980 ' The Filer subroutine
990 '
1000 DEF SEG
1010 M=SCREEN (25,9) : COLOR 7,0 : LOCAT
E 25,1,1 : PRINT"Do you really want to g
o to the FILER?  Y/N ";
1020 A$=INKEY$ : IF A$="" THEN GOTO 1020

1030 IF A$="Y" OR A$="y" THEN GOTO 1050
1040 LOCATE 25,1,0 : PRINT"COLOUR
                          "; : LOCAT
E 25,9,0 : PRINT CHR$(M); : DEF SEG= &HB
000 : GOTO 240
1050 LOCATE 25,1,1 : PRINT"Do you want t
o SAVE or LOAD a picture?  S/L ";
1060 A$=INKEY$ : IF A$="" THEN GOTO 1060

1070 IF A$="S" OR A$="s" THEN GOTO 1100
1080 IF A$="L" OR A$="l" THEN GOTO 1210
1090 LOCATE 25,1,0 : PRINT"COLOUR
                          "; : LOCA
TE 25,9,0 : PRINT CHR$(M); : DEF SEG= &H
B000 : GOTO 240
1100 LOCATE 25,1,0 : POKE &H5B,25 : POKE
 &H5C,25
1110 PRINT "

          "; : LOCATE 25,1,1 : INPUT "
Enter the name of this picture - ",NA$
1120 POKE &H5B,1 : POKE &H5C,25
1130 IF LEN(NA$) < 1 THEN BEEP : GOTO 11
00
1140 IF INSTR(NA$,".")<>0 THEN BEEP : GO
TO 1100
1150 LOCATE 25,1,0 : PRINT "

                          ";
1160 ON ERROR GOTO 1350
1170 DEF SEG= &HB000 : BSAVE NA$+".PIC",
0,&H1000
1180 ON ERROR GOTO 0
1190 DEF SEG : PLAY "O2L30CDEFAB"
1200 POKE &H5B,1 : POKE &H5C,24 : LOCATE
 25,1,0 : PRINT "COLOUR  ";CHR$(M); : DE
F SEG= &HB000 : GOTO 240
1210 LOCATE 25,1,0 : POKE &H5B,25 : POKE
 &H5C,25
1220 PRINT "

          "; : LOCATE 25,1,1 : INPUT "
Enter the name of the picture - ",NA$
1230 POKE &H5B,1 : POKE &H5C,25
1240 IF LEN(NA$) < 1 THEN BEEP : GOTO 12
10
1250 IF INSTR(NA$,".")<>0 THEN BEEP : GO
TO 1210
1260 LOCATE 25,1,0 : PRINT "

                          ";
1270 ON ERROR GOTO 1350
1280 DEF SEG= &HB000 : BLOAD NA$+".PIC",
0
1290 ON ERROR GOTO 0
1300 DEF SEG : PLAY "O2L30CDEFAB"
1310 POKE &H5B,1 : POKE &H5C,24 : LOCATE
 25,1,0 : PRINT "COLOUR  ";CHR$(M); : DE
F SEG= &HB000 : GOTO 240
1320 '
1330 ' A little ON ERROR subroutine
1340 '
1350 IF ERL = 1170 OR ERL = 1280 THEN PL
AY"O1L6DC" : DEF SEG= &HB000 : LOCATE 25
,1,0 : PRINT "COLOUR  ";CHR$(M); : RESUM
E 240
1360 BEEP : PRINT ERR,ERL : END
1370 '
1380 ' The palette subroutine
1390 '
1400 M=SCREEN (25,9) : COLOR 7,0 : RESTO
RE 1430 : LOCATE 25,1,1 : FOR ML=1 TO 12
 : READ OF,OB,W$ : COLOR OF,OB : PRINT W
$; : NEXT
1410 A$=INKEY$ : IF A$="" THEN GOTO 1410

1420 LOCATE 25,1,0 : COLOR 7,0 : PRINT"C
OLOUR          "; : LOCATE 25,9,0 : PRINT
CHR$(M); : GOTO 240
1430 DATA 2,0,1,1,0,2,10,0,3,9,0,4,18,0,
5,17,0,6,26,0,7,25,0,8,0,7,9,8,7,0,15,7,
-,24,7,=
1440 '
1450 ' The Key defining/decoding subrout
ines
1460 '
1470 KEY 1,CHR$(176) : KEY 2,CHR$(22) :
KEY 3,CHR$(177) : KEY 4,CHR$(178) : KEY
5,CHR$(221) : KEY 6,CHR$(222) : KEY 7,CH
R$(223) : KEY 8,CHR$(254) : KEY 9,CHR$(2
20) : KEY 10,CHR$(219) : RETURN
1480 KEY 1,"LIST " : KEY 2,"RUN"+CHR$(13
) : KEY 3,"LOAD"+CHR$(34) : KEY 4,"SAVE"
+CHR$(34) : KEY 7,"TRON"+CHR$(13) : KEY
8,"TROFF"+CHR$(13) : KEY 9,"KEY " : KEY
5,"CONT"+CHR$(13)  : KEY 6,","+CHR$(34)+
"LPT1:"+CHR$(34)+CHR$(13)
1490 KEY 10,"SCREEN 0,0,0"+CHR$(13)
1500 END
1510 DIM DK$(29)
1520 RESTORE 1530 : FOR ML=0 TO 29 : REA
D MV : DK$(ML)=CHR$(MV) : NEXT : RETURN
1530 DATA 218,191,192,217,193,195,194,18
0,179,196,1,2,174,175,240,247,249,15,20
,197,201,187,200,188,202,204,203,185,186
,205
1540 M=SCREEN (25,9) : COLOR 7,0 : LOCAT
E 25,1,1 : PRINT"Enter the key you want
to change - ";
1550 A$=INKEY$ : IF A$="" THEN GOTO 1550

1560 MV=ASC(RIGHT$(A$,1)) : IF MV < 83 A
ND MV<114 THEN GOTO 1580
1570 LOCATE 25,1,0 : PRINT"COLOUR
                          "; : LOCATE 25,9,0
 : PRINT CHR$(M); : GOTO 240
1580 LOCATE 25,1,0 : PRINT "Enter charac
ter -                     "; : LOCATE 25,19
,1
1590 MV$=INKEY$ : IF MV$="" THEN GOTO 15
90
1600 DK$(MV-84)=MV$ : GOTO 1570
1610 CLS : PRINT "TEXTER instructions."
: PRINT
1620 PRINT"TEXTER is a picture drawing u
tility that enables you to plot any char
acter on"
1630 PRINT"the screen in any one of the
12 "; : COLOR 9 : PRINT "different"; : C
OLOR 7 : PRINT" colours (or shades) avai
lable in the"
1640 PRINT"monochrome adapter."
1650 COLOR 0,7 : PRINT"COMMANDS..."; : C
OLOR 7,0 : PRINT
1660 PRINT"Cursor Keys move cursor with
wrap around."
1670 PRINT "F1-F10 : Various block chara
cters."
1680 PRINT "SHFT & ALT F1-F10 : Single a
nd double line characters."
1690 PRINT "CNTRL F1-F10 : Misc. charact
ers and single and double line cross."
1700 PRINT"ALT-1,2,3,4,5,6,7,8,9,0,-,=
:  Change colour to one of the 12 colour
s."
1710 PRINT"ALT-Q  : Quit"
1720 PRINT"ALT-E  : Erase picture."
1730 PRINT"ALT-F  : The filer, so you ca
n load and save your pictures."
1740 PRINT"ALT-P  : The palette. Display
s the colours and their numbers."
1750 PRINT"ALT-D  : Allows you to change
 ALT, SHFT, CNTRL F1-F10 to any other ch
aracter."
1760 PRINT"ALT-K  : Toggles the function
 that moves one space right when you pre
ss a key."
1770 PRINT"ALT-J  : The same as ALT-K, o
nly the cursor moves left."
1780 PRINT"ALT-I  : The same as ALT-K, o
nly the cursor moves up."
1790 PRINT"ALT-M  : The same as ALT-K, o
nly the cursor moves down."
1800 LOCATE 23 : INPUT "Press enter-",X$

1810 CLS : RETURN
```

Character Editor

by Damon Auger

New graphics and text characters, including those in the range 132 to 255, can be drawn on the screen using the joystick, with the fire button setting and unsetting dots. A key is pressed to display the character numbers, and the character can be placed in memory.

```
' DIM BT(8,8)
' SYMBOL AFTER 32
' SYMBOL 128,0,0,0,0,0,0,0,255
' SYMB...
' SYMBOL 131,255,255,255,255,255,255,255,255
CLS
ro$=CHR$(131)+ro$+CHR$(32):cc=5:c=4
CH=132
LOCATE 1,1
PRINT"   CHARACTER  ";ch
PRINT
PRINT"    ";:FOR A = 0 TO 7 : PRINT CHR$(128);:NEXT
PRINT
FOR x=0 TO 7
PRINT"  ";:
NEXT
PRINT"    ";:FOR A = 0 TO 7 : PRINT CHR$(128);:NEXT
PRINT
ORIGIN 1,1:PRINT:PRINT:PRINT:PRINT:PRINT TAB(22,"KEY"
PRINT TAB(28)"1, CLEAR CHAR"
PRINT TAB(28)"2, SAVE CHAR TO MEM"
PRINT TAB(28)"0, OTHER FUNCTION"
GOTO 9000
END

x=x+(JX=1)-(JX=2)
IF JY = 1 THEN c=c-1:IF c< 1 THEN c=1
IF JY = 2 THEN c=c+1:IF c> 11 THEN c=8
IF JX = 1 THEN cc=cc-1:IF cc< 5 THEN cc=12
IF JY = 2 THEN cc=cc+1:IF cc> 12 THEN cc=5
IF JX AND 16 THEN fr = 1
RETURN
x=x+4:c=c-3
RETURN
CLS
PRINT:PRINT
PRINT" 1.  NEW CHAR"
PRINT" 2.  QUIT"
PRINT" 3.  DISPLAY CHAR, BYTES"
PRINT" 4.  RETURN TO CHAR"
a$=INKEY$:IF a$="" THEN 4100
IF a$="1" THEN 4200
IF a$="4" THEN 4400
IF a$="2" THEN 4040
PRINT:INPUT"ARE YOU SURE";D$
a$=UPPER$(D$):IF a$="Y" THEN 4000
END

PRINT:PRINT:PRINT"Your previous character was";CH
INPUT"WHICH CHAR";CH
IF CH<132 OR CH 255 THEN PRINT"ILLEGAL CHAR":GOTO 4110
CLS
GOTO 7010
PRINT:PRINT
FOR Z=1 TO 8:W=0:FOR O=1 TO 8
IF BT(Z,O)=1 THEN W=W+2^(8-O)
NEXT O
W(Z)=W
PRINT W(Z)
NEXT Z
PRINT:PRINT"ACTUAL BITS MAY NOT APPEAR"
PRINT"MOVE JOYSTICK OVER BIT LOCATIONS TO "
PRINT"MAKE THEM SHOW UP."

PRINT:PRINT TAB(10)"PRESS ANY KEY TO READ"
a$=INKEY$:IF a$="" THEN 4440
CLS
GOTO 1000
CLS
FOR Z=1 TO 8:FOR O=1 TO 8:BT(Z,O)=0:NEXT O:NEXT Z
GOTO 1000
FOR Z=1 TO 8:W=W(Z):FOR O=8 TO 1 STEP -1
IF W=0 THEN 5010
BT(Z,O)=W-2*INT(W/2):W=INT(W/2)
NEXT O
NEXT Z
SYMBOL CH,W(1),W(2),W(3),W(4),W(5),W(6),W(7),W(8)
CLS:PRINT"CHARACTER ";CH;" APPEARS AS :":CHR$(CH)
FOR N=1 TO 5000:NEXT
GOTO 4000
END
LOCATE c,cc:PRINT"+"
FOR N=1 TO 50:NEXT
a$=INKEY$
IF a$="0" THEN 4000
IF a$="1" THEN 7000
IF a$="2" THEN 8000
JX=JOY(0)
IF JX=0 THEN 9000
GOSUB 3000
LOCATE c,cc:IF BT(c,cc)=1 THEN PRINT CHR$(128);:GOTO 9000 ELSE PRINT" ";:GOTO 9000
GOSUB 2000:GOSUB 3000:IF FR = 1 THEN IF BT(Y,X)=1 THEN BT(Y,X)=0 ELSE BT(Y,X)=1
GOTO 9000

DEMO PROGRAM

' UDG DEMO  BY SHAUN HOLMES 1985
' SYMBOL AFTER 32
' USES START AFTER =&C00  TO =&C7FF
' SYMBOL 128,0,0,128,128,128,255,255,0,0
' CHRS 128 DEFINED AS "+" NUMBER 43
' FROM OPTION 2 ON MENU
' SYMBOL 130,0,0,0,0,0,0,255,0,0
' SYMBOL 131,0,0,0,0,0,0,0,255
' SYMBOL 132,16,16,16,16,16,16,16,16
' SYMBOL 133,24,24,24,24,24,24,24,24
' MORE UDGS USING METHOD DETAILED ABOVE
' WHAT FOLLOWS IS A DEMO OF SOME
' PEN 1:PAPER 2:CLS
' PEN 2:PAPER 0
' FOR I=1 TO 10:PRINT:NEXT
' PRINT THE 5 CHRS 128 THRU 132
' FOR I=1 TO 500:NEXT
' PEN 1
' PRINT THE 32 CHRS
' FOR I=1 TO 10:PRINT:NEXT
' PEN 2
' PRINT CHR$(13);"DEMO OVER"
```

Triangle Solver

by Axel Hansen

This maths utility program will work out the side lengths and angles of a triangle, given three sides or two sides and one angle. It will also draw a scale picture of the triangle.

```
10 MODE 2:GOTO 60
20 PRINT TAB (20) "YOUR CHOICE: 1 -";CH
;" ";
30 INPUT CS
40 IF CS<1 OR CS>CH THEN GOTO 20
50 RETURN
60 REM TRIANGLES **********
70 CLS
80 PRINT TAB(20)"MENU of TRIANGLES"
90 PRINT TAB(20)"-----------------"

100 PRINT
110 PRINT TAB(20)"Given:a,b,c     =1
120 PRINT TAB(20)"Given:b,c,A     =2"
130 PRINT TAB(20)"Given:A,a,c     =3"
140 PRINT
150 CH=3:GOSUB 20
160 ON CS GOSUB 170,500,940
170 CLS:PRINT"TRIANGLE WITH 3 SIDES GIV
EN "
180 PRINT
190 PRINT:GOSUB 200:LOCATE 69,6:PRINT"c
":LOCATE 65,3:PRINT"b":LOCATE 73,3:PRIN
T"a":GOTO 210
200 PLOT 500,300:DRAW 600,300:DRAW 550,
390:DRAW 500,300:RETURN
210 INPUT"SIDE a= ";a
220 INPUT"SIDE b= ";b
230 INPUT"SIDE c= ";c
240 REM check if input produces a trian
gle
250 IF a)=b+c THEN 290 ELSE
260 IF b)=a+c THEN 290 ELSE
270 IF c)=a+b THEN 290 ELSE
280 GOTO 310
290 PRINT
300 PRINT"CHECK YOUR INPUT;THEN PRESS R
 FOR REPEAT":GOTO 450
310 s=(a+b+c)/2:DEG
320 V=2*ATN(SQR(((s-b)*(s-c))/(s*(s-a))
))
330 E=2*ATN(SQR(((s-a)*(s-c))/(s*(s-b))
))
340 F=2*ATN(SQR(((s-a)*(s-b))/(s*(s-c))
))
350 LOCATE 20,4:PRINT "A=";
360 PRINT USING"###.##";V;
370 PRINT " DEGREES"
380 LOCATE 20,5:PRINT "B=";
390 PRINT USING"###.##";E;
400 PRINT " DEGREES"
410 LOCATE 20,6:PRINT "C=";
420 PRINT USING"###.##";F;
430 PRINT " DEGREES"
440 GOSUB 780
450 LOCATE 1,25: PRINT"REPEAT=R  EXIT=E
"
460 a$=INKEY$:IF a$=" " GOTO 460
470 IF a$="R" OR a$="r" GOTO 170
480 IF a$="E" OR a$="e" GOTO 60
490 GOTO 450
500 CLS: REM Angle with two adjacent si
de given**********
510 PRINT"TRIANGLE WITH ANGLE AND 2 ADJ
ACENT SIDES GIVEN"
515 GOSUB 200:LOCATE 69,6:PRINT"c":LOCA
TE 65,3:PRINT"b":LOCATE 61,6:PRINT"A"

540 LOCATE 1,4:INPUT"ANGLE A= ",V

550 INPUT "SIDE  b= ",b
560 INPUT "SIDE  c= ",c
570 REM check if input produces a trian
gle
580 IF V)=180 OR V=0 THEN 610 ELSE
590 IF b=0 OR c=0 THEN 610 ELSE
600 GOTO 620
610 PRINT"CHECK YOUR INPUT,THEN PRESS R
 FOR REPEAT":GOTO 730
620 PRINT
630 DEG
640 a=SQR(b^2+c^2-2*b*c*COS(V))
650 F=b*SIN(V)/a
660 F=ATN(F/SQR(1-F^2))
670 F=180-V-F
680 LOCATE 20,4:PRINT "a=";CINT(a)
690 LOCATE 20,5:PRINT "B=";
700 PRINT USING"###.##";F;:PRINT" Degre
es"
710 LOCATE 20,6:PRINT "C=";
720 PRINT USING"###.##";R;:PRINT" Degre
es"
730 LOCATE 1,25:PRINT"REPEAT=R  EXIT=E"
740 A$=INKEY$:IF A$="" GOTO 740
750 IF A$="R" OR A$="r" GOTO 500
760 IF A$="E" OR A$="e" GOTO 60
770 GOTO 730
780 ' Sort
790 IF a<=b THEN 830 ELSE
800 IF a<=c THEN 860 ELSE
810 'a is biggest

820 x=a:GOTO 880
830 IF b<=c THEN 860 ELSE
840 'b is biggest
850 x=b:GOTO 880
860 'c is biggest
870 x=c
880 g=300/x
890 cc=c*g:bb=b*g:aa=a*g
900 PLOT 320,15:DRAW(320+cc),15:DRAW (3
20+bb*COS(V)),(15+bb*SIN(V)):DRAW 320,1
5

910 LOCATE 38,24:PRINT"A":LOCATE (42+cc
/8),24:PRINT"B":LOCATE (40+bb*COS(V)/8)
,(23-(bb*SIN(V)/16)):PRINT"C":LOCATE (4
0+cc/16),24:PRINT"c"
920 LOCATE(76+bb*COS(V)/8)/2,(48-(bb*SI
N(V)/16))/2:PRINT"b":LOCATE(84+cc/8+bb*
COS(V)/8)/2,(48-(bb*SIN(V)/16))/2:PRINT
"a":RETURN
930 REM Angle with opposite and adjacen
t sides given**********
940 CLS:PRINT"TRIANGLE WITH ANGLE,OPPOS

ITE & ADJACENT SIDES GIVEN"
950 GOSUB 200:LOCATE 69,6:PRINT"c":LOCA
TE 73,3:PRINT"a":LOCATE 61,6:PRINT"A"
960 LOCATE 1,4:INPUT"ANGLE A= ",V:INPUT
 "SIDE  a= ",a:INPUT "SIDE  c= ",c
970 REM check if input produces a trian
gle
980 IF a=0 OR c=0 THEN 1320 ELSE
990 IF V<=0 OR V)=180 THEN 1320 ELSE

1000 IF a<c GOTO 1100 ELSE
1010 DEG:y=(SIN(V)*c)/a:D=ATN(y/SQR(1-y
^2)):E=180-(D+V):b=(a*SIN(E))/SIN(V)

1020 PRINT
1030 IF a=c AND V<=90 GOTO 1320 ELSE
1040 LOCATE 19,4:PRINT "B=";
1050 PRINT USING"###.##";E;:PRINT" Degr
ees"
1060 LOCATE 19,5:PRINT "C=";
1070 PRINT USING"###.##";D;:PRINT" Degr
ees"

1080 LOCATE 19,6:PRINT "b=";CINT(b)
1090 GOSUB 780:GOTO 1340
1100 IF V>90 GOTO 1320 ELSE
1110 IF a<c*SIN(V) GOTO 1320 ELSE
1120 DEG:y=(SIN(V)*c)/a:D=ATN(y/SQR(1-y
^2)):E=180-(D+V):b=(a*SIN(E))/SIN(V)
1130 PRINT
1140 LOCATE 19,4:PRINT "B=";
1150 PRINT USING"###.##";E;:PRINT" Degr
ees"

1160 LOCATE 19,5:PRINT "C=";
1170 PRINT USING"###.##";D;:PRINT" Degr
ees"
1180 LOCATE 19,6:PRINT "b=";CINT(b)

1190 GOSUB 780
1200 IF D=90 THEN 1330 ELSE
1210 DEG:G=180-D:H=D-V:k=(a*SIN(H))/SIN
(V)
1220 PLOT (320+cc),15:DRAW (320+cc-aa*C
OS(H)),(15+aa*SIN(H)):LOCATE (43+cc/8),
24:PRINT",B1"

1230 LOCATE (39+(cc-aa*COS(H))/8),(23-a
a*SIN(H)/16):PRINT"C1"
1240 LOCATE (38+(320+cc-aa*COS(H))/8)/2
,(48-(15+aa*SIN(H))/16)/2:PRINT"b1"
1250 IF a=c GOTO 1340 ELSE
1260 LOCATE 40,4:PRINT "B1=";
1270 PRINT USING "###.##";H;:PRINT" Deg
rees"
1280 LOCATE 40,5:PRINT "C1=";
1290 PRINT USING "###.##";G;:PRINT" Deg
rees"
1300 LOCATE 40,6:PRINT "b1=";CINT(k)


1310 GOTO 1340
1320 PRINT"CHECK YOUR INPUT,THEN PRESS
R FOR REPEAT":GOTO 1340
1330 LOCATE 1,7:PRINT"
 "
1340 LOCATE 1,25:PRINT"REPEAT=R  EXIT=E
"
1350 a$=INKEY$:IF a$="" GOTO 1350

1360 IF a$="R" OR a$="r" GOTO 940
1370 IF a$="E" OR a$="e" GOTO 60
1380 GOTO 1340
```

IBM

Third Dimension Simulation

by Grant Elliott

Reading 3-D co-ordinates from the data statements, this program will draw a wire-frame cube (or pyramid or house, for which other data statements are provided), rotated about the x, y and z axes according to formulae worked out by the author.

The first data statement contains the number of lines for the drawing (extremely important), the rest being the actual co-ordinates. Running the program involves typing in the degrees of rotation according to prompts, and selecting a scale factor, the smaller the number the larger the object as it appears on the screen.

```
10 CLS:SCREEN 1
20 DIM X(100),Y(100),Z(100),A(100),B(100),C(100)
30 '*********************************************
40 '***          3D Graphics Emulator           ***
50 '*********************************************
60 '
70 '*********************************************
80 '***       Read 3D Data from DATA Statements  ***
90 '*********************************************
100 READ COUNT
110 FOR LOOP=1 TO COUNT
120     READ Z(LOOP),Y(LOOP),X(LOOP),C(LOOP),B(LOOP),A(LOOP)
130 NEXT
140 '*********************************************
150 '***    Input 3D Rotation Angles & Scale Factor ***
160 '*********************************************
170 INPUT "HORIZONTAL ROTATION (LEFT/RIGHT ) = ",H
180 INPUT "VERTICAL ROTATION (UP/DOWN) = ",V
190 INPUT "Z-AXIS ROTATION (TWIST LEFT/RIGHT) = ",A
200 INPUT "SCALE FACTOR = ",SF
210 IF SF=0 THEN RUN 'Eliminate Division by Zero Error
220 GOSUB 350 ' Set to Correct Scale
230 '*********************************************
240 '***     Do Calculations and then Draw Object  ***
250 '*********************************************
260 FOR LOOP=1 TO COUNT
270     GOSUB 390
280 NEXT LOOP
290 '*********************************************
300 '***       Wait for keypress the re-run program ***
310 '*********************************************
320 GOSUB 610::CLS:RUN
330 ' Scaling Subroutine
340 ' ******************
350 FOR K=1 TO COUNT
360       Z(K)=Z(K)/SF:Y(K)=Y(K)/SF:X(K)=X(K)/SF
370       A(K)=A(K)/SF:B(K)=B(K)/SF:C(K)=C(K)/SF
380 NEXT:RETURN
390 '
400 ' Main Rotational and Display Subroutine
410 ' **************************************
420   GOSUB 490:XP=X:YP=Y
430   X(LOOP)=A(LOOP):Y(LOOP)=B(LOOP):Z(LOOP)=C(LOOP)
440 GOSUB 490
450   LINE (XP,YP)-(X,Y)
460 RETURN
470 ' Calculation and Conversion Subroutine
480 ' **************************************
490 H1=H/(45/ATN(1)):X1 = X(LOOP)*COS(H1) + Z(LOOP)*SIN(H1)
500 Y1 = Y(LOOP):Z1 = -X(LOOP)*SIN(H1) + Z(LOOP)*COS(H1)
510 V1=V/(45/ATN(1)):X2 = X1*COS(V1) + Y1*SIN(V1)
520 Y2 = -X1*SIN(V1) + Y1*COS(V1):Z2=Z1
530 A1=A/(45/ATN(1)):X3=X2
540 Y3=Y2*COS(A1)+Z2*SIN(A1):Z3=-Y2*SIN(A1)+Z2*COS(A1)
550 YC = Y3 : XC = Z3
560 Y = 100 - 33.3333 * YC:'Set Scale for Y Axis & Origin
570 X = 40  * XC + 160 :'   Set Scale for X Axis & Origin
580 RETURN
590 'Check for keypress Subroutine
600 '*****************************
610 A$=INKEY$:IF A$="" THEN 610
620 RETURN
1020 '*********************************************
1030 '****          3D DATA IS PLACED BELOW          ****
1040 '*********************************************
1050 DATA 12
1060 DATA 0,0,0,1,0,0,1,0,0,1,1,0,1,1,0,0,1,0,0,1,0,0,0,0
1070 DATA 0,0,0,0,0,1,1,1,0,1,1,1,0,0,1,0,1,0,1,0,1,0,1,1
1080 DATA 0,0,1,1,0,1,1,1,0,1,1,1,1,1,1,1,1,1,0,1,1,0,0,1

Extra Data Statements
```

Pyramid

```
1050 DATA 8
1060 DATA 0,0,0,2,0,0,2,0,0,2,0,2,2,0,2,0,0,2,0,0,2,0,0,0
1070 DATA 0,0,0,1,2,1,1,2,1,2,0,0,2,0,2,1,2,1,1,2,1,0,0,2
1080 DATA 0,0,1,1,0,1,1,0,1,1,1,1,1,1,1,1,0,1,1,0,1,1,0,1
```

House

```
1050 DATA 26
1060 DATA 0,0,0,0,1,0,0,0,0,1,0,0,1,0,0,1,1,0
1070 DATA 0,0,3,0,1,3,0,0,3,1,0,3,1,0,3,1,1,3
1080 DATA 0,0,0,0,0,3,0,1,0,0,1,3,1,0,0,1,0,3
1090 DATA 1,1,0,1,1,3,0,1,0,.5,2,0,.5,2,0,1,1,0
1100 DATA 0,1,3,.5,2,3,.5,2,3,1,1,3,.5,2,3,.5,2,0
1110 DATA 1,0,1,1,.7,1,1,.7,1,1,.7,2,1,.7,2,1,0,2
1120 DATA 1,.5,.2,1,.8,.2,1,.8,.2,1,.8,.6,1,.8,.6,1,.5,.6
1130 DATA 1,.5,.6,1,.5,.2
1140 DATA 1,.5,2.2,1,.8,2.2,1,.8,2.2,1,.8,2.6,1,.8,2.6
1150 DATA 1,.5,2.6,1,.5,2.6,1,.5,2.2
```

ATARI

Metric Conversion

by Jared Waddams

Nine metric conversions are performed – temperature, area, volume, two measures of weight and four of length, Imperial to metric or vice versa.

```
0 CLR :CLOSE #1:DIM AN$(24),DA$(50)
1 REM ************************
2 REM =HANDY MATHS CALCULATIONS=
3 REM - BY  JARED WADDAMS 1986
4 REM ************************
5 REM
55 REM
57 TRAP 5:OPEN #1,4,0,"K:"
60 GRAPHICS 18:DL=PEEK(560)+256*PEEK(561)+4:POKE DL+1,70:POKE DL+2,6
65 SETCOLOR 2,14,0:SETCOLOR 4,13,4:SETCOLOR 1,13,14
70 POKE 752,1:POKE 82,2:POKE 83,37
72 SETCOLOR 1,10,14
75 DIM SA$(70)
80 ? #6;POSITION 10,0:FOR X=1 TO 29:READ Y:SA$(X,X)=CHR$(Y):NEXT X
81 DATA 32,229,244,242,237,229,32,237,229,244,246,229,242,245,237,229,236,24
7,32,32,32,78,121,32
82 DATA 106,97,114,101,100,32,119,97,100,100,97,109,115,32
85 ? #6
90 POKE 82,0:? "(1) ACRES   -- HECTARES"
100 ? "(2) CELSIUS -- FAHRENHEIT"
110 ? "(3) MILES   -- KILOMETRES"
120 ? "(4) INCHES  -- CENTIMETRES"
130 ? "(5) INCHES  -- MILLIMETRES"
140 ? "(6) METRES  -- FEET"
150 ? "(7) LITRES  -- GALLONS"
160 ? "(8) POUNDS  -- KILOGRAMS"
170 ? "(9) OUNCES  -- GRAMS"
180 POKE 82,2:POSITION 12,12:? "WHICH NUMBER ";:INPUT A
190 GOTO A#(A*4-3)
200 REM
201 GOSUB 30000:POSITION 2,5:? "HOW MANY ACRES ";:INPUT A
1015 ANS=A*.4047
1020 ? :? A;" ACRES IS ";ANS;" HECTARES."
1025 GOSUB 31000:GOSUB 30000
1030 POSITION 2,5:? "HOW MANY HECTARES ";:INPUT A
1035 ANS=A*2.471
1040 ? :? A;" HECTARES IS ";ANS;" ACRES."
1045 GOSUB 31000:RUN
1140 RUN
1190 REM
1191 GOSUB 30000:POSITION 2,5:? "INPUT TEMPERATURE";:? " IN DEGREES F ";:INPUT
F
1195 ANS=(F-32)*5/9
1200 ? :? "TEMPERATURE IN DEGREES C IS ";ANS
1202 GOSUB 31000
1205 GOSUB 30000:POSITION 2,5:? "INPUT TEMPERATURE";:? " IN DEGREES C ";:INPUT
F
1210 ANS=(F*9/5)+32
1215 ? :? "TEMPERATURE IN DEGREES F IS ";ANS
1216 GOSUB 31000
1250 RUN
1290 REM
1291 GOSUB 30000:POSITION 2,5:? "INPUT MILES ";:INPUT MA
1292 ANS=MA*1.621
1295 ? :? MA;" MILES IS ";ANS;" KILOMETRES"
1297 GOSUB 31000
1299 GOSUB 30000:POSITION 2,5:? "INPUT KILOMETRES ";:INPUT MA
1300 ANS=MA*0.621
1305 ? :? MA;" KILOMETRES IS ";ANS;" MILES"
1345 GOSUB 31000
1350 RUN
1390 REM
1391 GOSUB 30000:POSITION 2,5:? "HOW MANY CENTIMETRES ";:INPUT C
1395 ANS=C/2.54
1400 ? :? C;" CENTIMETRES IS ";ANS;" INCHES"
1405 GOSUB 31000
1410 GOSUB 30000:POSITION 2,5:? "HOW MANY INCHES ";:INPUT C
1415 ANS=C*2.54
1420 ? :? C;" INCHES IS ";ANS;" CENTIMETRES"
1425 GOSUB 31000
1430 RUN
1490 REM
1491 GOSUB 30000:POSITION 2,5:? "HOW MANY MILLIMETRES";:INPUT M
1495 ANS=M/25.4
1500 ? :? M;" MILLIMETRES IS ";ANS;" INCHES."
1505 GOSUB 31000
1510 GOSUB 30000:POSITION 2,5:? "HOW MANY INCHES ";:INPUT M
1515 ANS=M*25.4
1520 ? :? M;" INCHES IS ";ANS;" MILLIMETRES."
1525 GOSUB 31000
1530 RUN
1590 REM
1591 GOSUB 30000:POSITION 2,5:? "HOW MANY METRES ";:INPUT F
1595 ANS=F*3.2808
1600 ? :? F;" METRES IS ";ANS;" FEET."
1605 GOSUB 31000
1610 GOSUB 30000:POSITION 2,5:? "HOW MANY FEET ";:INPUT F
1615 ANS=F*.3048
1620 ? :? F;" FEET IS ";ANS;" METRES."
1625 GOSUB 31000
1650 RUN
1690 REM
1691 GOSUB 30000:POSITION 2,5:? "HOW MANY LITRES ";:INPUT F
1695 ANS=F*0.22
1700 ? :? F;" LITRES IS ";ANS;" GALLONS."
1705 GOSUB 31000
1710 GOSUB 30000:POSITION 2,5:? "HOW MANY GALLONS ";:INPUT F
1715 ANS=F*4.546
1720 ? :? F;" GALLONS IS ";ANS;" LITRES."
1725 GOSUB 31000
1750 RUN
1790 REM
1791 GOSUB 30000:POSITION 2,5:? "HOW MANY POUNDS ";:INPUT F
1795 ANS=F*0.4536
1800 ? :? F;" POUNDS IS ";ANS;" KILOGRAMS."
1805 GOSUB 31000
1810 GOSUB 30000:POSITION 2,5:? "HOW MANY KILOGRAMS ";:INPUT F
1815 ANS=F*2.2046
1820 ? :? F;" KILOGRAMS IS ";ANS;" POUNDS."
1825 GOSUB 31000
1850 RUN
1890 REM
1891 GOSUB 30000:POSITION 2,5:? "HOW MANY OUNCES ";:INPUT F
1895 ANS=F*28.35
1900 ? :? F;" OUNCES IS ";ANS;" GRAMS."
1905 GOSUB 31000
1910 GOSUB 30000:POSITION 2,5:? "HOW MANY GRAMS ";:INPUT F
1915 ANS=F*0.035274
1920 ? :? F;" GRAMS IS ";ANS;" OUNCES."
1925 GOSUB 31000
1950 RUN
29999 END
30000 ? #6;:? #6;POSITION 2,23;"(R)ETURN
30010 IF NEXT THEN NEXT A
31000 POSITION 17,22:? "PRESS ANY KEY":SET #1;A:RETURN
```


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SPECTRAVIDEO

Data Font

by P.D. Drew

This produces a new style font for the Spectravideo 318 or 328, based on the computer-style Data type font. New values are POKEd into video RAM locations 2816 to 3575, replacing the inverse characters.

Type in the program and SAVE it. To use it, delete lines 1 to 250 and append the remaining lines to your program. POKE 65077, 1 to change to the font, and POKE 65077, 0 to return to the normal font.

```
1 ' ********************************
2 ' *                              *
3 ' *       -=< DATAFONT >=-       *
4 ' *                              *
5 ' *      By Paul David DREW      *
6 ' *                              *
7 ' *      83 Caernarvon Drive     *
8 ' *                              *
9 ' *      Flaxmere, HASTINGS.     *
10 '*                              *
11 '*       14 December 1984.      *
12 '*                              *
13 '********************************
14 '
100 CLS
110 POKE65077!,1
120 LOCATE5,1:PRINT"
130 LOCATE5,2:PRINT"
140 LOCATE5,3:PRINT"
150 LOCATE5,4:PRINT"
160 LOCATE5,5:PRINT"
170 LOCATE5,6:PRINT"
180 LOCATE5,7:PRINT"
190 LOCATE5,8:PRINT"

200 LOCATE5,9:PRINT"
210 LOCATE5,10:PRINT"
220 LOCATE5,11:PRINT"
230 LOCATE5,12:PRINT"
240 LOCATE5,13:PRINT"
250 LOCATE5,14:PRINT"
260 FORT=1TO2000:NEXTT
270 FOR V=2816 TO 3575
280 READA:VPOKEV,A:NEXT:POKE65077!,0
290 DATA0,0,0,0,0,0,0,0

300 DATA32,32,48,48,0,48,48,0
310 DATA108,108,0,0,0,0,0,0
320 DATA80,80,248,80,248,80,80,0
330 DATA32,248,128,248,24,152,248,32
340 DATA192,200,16,32,64,152,24,0
350 DATA112,64,80,248,208,208,240,0
360 DATA24,48,96,0,0,0,0,0
370 DATA24,56,64,64,64,56,24,0
380 DATA192,224,16,16,16,224,192,0
390 DATA16,84,56,108,56,84,16,0
400 DATA0,48,48,255,255,48,48,0
410 DATA0,0,0,0,0,48,48,64
420 DATA0,0,0,248,248,0,0,0
430 DATA0,0,0,0,0,96,96,0
440 DATA0,0,0,12,24,48,96,192
450 DATA248,136,136,152,152,152,248,0
460 DATA16,16,16,48,48,48,48,0
470 DATA248,136,8,248,192,200,248,0
480 DATA240,144,16,120,24,152,248,0
490 DATA248,136,136,136,252,24,24,0

500 DATA248,128,128,248,24,152,248,0
510 DATA248,136,128,248,152,152,248,0
520 DATA248,8,8,24,24,24,24,0
530 DATA112,80,80,248,152,152,248,0
540 DATA248,136,136,248,24,24,24,0
550 DATA0,48,48,0,0,48,48,0
560 DATA0,48,48,0,0,48,48,64
570 DATA24,48,96,192,96,48,24,0
580 DATA0,248,248,0,248,248,0,0
590 DATA192,96,48,24,48,96,192,0
600 DATA248,8,8,248,192,0,192,192

610 DATA240,144,144,184,136,200,216,0
620 DATA112,80,80,248,200,200,200,0
630 DATA240,144,144,248,200,200,248,0
640 DATA248,136,128,192,200,200,248,0
650 DATA248,136,136,200,200,200,248,0
660 DATA248,128,128,248,192,192,248,0
670 DATA248,128,128,248,192,192,192,0
680 DATA248,136,128,216,200,200,248,0
690 DATA136,136,136,248,200,200,200,0
700 DATA32,32,32,48,48,48,48,0
710 DATA16,16,16,24,24,152,248,0
720 DATA144,144,144,248,200,200,200,0

730 DATA128,128,128,192,192,192,248,0
740 DATA252,148,148,212,212,212,212,0
750 DATA248,136,136,200,200,200,200,0
760 DATA248,152,136,136,136,136,248,0
770 DATA248,136,136,248,192,192,192,0
780 DATA248,136,136,136,136,152,248,0
790 DATA240,144,144,248,200,200,200,0
800 DATA248,136,128,248,24,152,248,0
810 DATA248,32,32,48,48,48,48,0
820 DATA136,136,136,200,200,200,248,0
830 DATA200,200,200,200,80,80,112,0
840 DATA148,148,148,212,212,212,252,0
850 DATA136,136,136,112,200,200,200,0
860 DATA136,136,136,248,48,48,48,0
870 DATA248,136,8,248,192,200,248,0
880 DATA240,240,192,192,192,240,240,0
890 DATA0,128,192,96,48,24,8,0
900 DATA120,120,24,24,24,120,120,0

910 DATA32,112,216,136,0,0,0,0
920 DATA0,0,0,0,0,248,248,0
930 DATA96,48,24,0,0,0,0,0
940 DATA0,120,72,8,120,104,120,0
950 DATA64,64,120,72,104,104,120,0
960 DATA0,120,72,64,96,104,120,0
970 DATA8,8,120,72,104,104,120,0
980 DATA0,120,72,120,96,104,120,0
990 DATA56,32,112,32,48,48,48,0

1000 DATA0,120,72,104,104,120,8,120
1010 DATA64,64,120,72,104,104,104,0
1020 DATA48,48,0,32,48,48,48,0
1030 DATA48,48,0,32,48,48,16,112
1040 DATA64,64,80,80,120,104,104,0
1050 DATA32,32,32,48,48,48,48,0
1060 DATA0,252,148,212,212,212,212,0
1070 DATA0,120,72,104,104,104,104,0
1080 DATA0,120,72,72,104,104,120,0
1090 DATA0,120,72,104,104,120,64,64
1100 DATA0,120,72,104,104,120,8,8

1110 DATA0,120,64,64,96,96,96,0
1120 DATA0,120,72,64,120,24,120,0
1130 DATA32,32,112,32,48,48,48,0
1140 DATA0,72,72,104,104,104,120,0
1150 DATA0,200,200,200,80,80,112,0
1160 DATA0,148,148,212,212,212,252,0

1170 DATA0,72,72,48,104,104,104,0
1180 DATA0,104,104,104,72,120,8,120
1190 DATA0,120,72,8,120,96,120,0
1200 DATA56,96,96,192,96,96,56,0
1210 DATA48,48,48,0,48,48,48,0
1220 DATA224,48,48,24,48,48,224,0
1230 DATA244,188,0,0,0,0,0,0
```

COMMODORE 64

Bomb Drop

by Chris Parker

This little program simulates the sound of a bomb dropping and then exploding.

```
COMMODORE 64 - BOMB DROP

1 REM BOMB DROP
2 REM BY CHRIS PARKER
10 POKE 54295,0:POKE 54296,15
20 VV=54272:POKE VV+6,245
30 POKE VV+1,6:POKE VV+5,0:POKE VV+4,33
40 FOR A=6000 TO 522 STEP-10
50 POKE VV+1,A/26:POKE VV,A AND 55
60 NEXT A
70 POKE VV+4,0
80 POKE VV+6,1:POKE VV+6,1:POKE VV+5,29
90 POKE VV+1,5:POKE VV+4,129
100 FOR S=1 TO 2500:NEXT S
110 POKE VV+4,0
120 POKE 54296,0
```

Typewriter

by Keith Wansbrough

Written especially for the Epson DMP-2000 printer, this routine will allow it to be used as a typewriter, with line 40 resetting the printer and NLQ-proprotional and incremental print modes.

```
10 ON BREAK CONT:MODE 2:CALL &BC02:CLS:PRINT
TAB(33)"TYPEWRITER":PRINT
20 PRINT"Set the printer ON-LINE and press any key.":
CALL &BB18
30 esc$=CHR$(27):n1$=CHR$(1):n0$=CHR$(0)
40 PRINT#8,esc$"@"esc$"x"n1$esc$"p"n1$esc$"i"n1$;
50 KEY 141,esc$:KEY 142,CHR$(255):KEY 143,CHR$(254):
KEY DEF 66,1,141:KEY DEF 26,1,&40,&7C,142:
KEY DEF 16,1,16,16,143
60 CLS:CURSOR 1
70 in$="":flg=-1:WHILE flg
80 k$=INKEY$:IF k$=""THEN 80
90 IF k$=CHR$(254) THEN PRINT#8,esc$"@":CLS:END
100 IF k$=CHR$(13) THEN flg=0:GOTO 130
110 IF k$=CHR$(127) THEN in$=MID$(in$,1,(LEN(in$)-1)):
PRINT CHR$(8);:GOTO 130 ELSE PRINT n1$k$;
120 in$=in$+k$:IF LEN(in$)=255 THEN flg=0
130 WEND:PRINT
140 FOR lp=1 TO LEN(in$):k$=MID$(in$,lp,1)
150 IF k$<>CHR$(255) THEN PRINT#8,k$;ELSE PRINT#8,n0$;
160 NEXT:PRINT#8
170 GOTO 70
```


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Z-80

Bomber

by Michael Lott

The object of this game is to land your crippled aircraft on a runway made by blasting the buildings away with your bombs, receiving on success the Computer Cross. It is written in Version 2.0 Basic, and may be obtained by sending $4.00 and a blank cassette to 11 Poynter St, Blenheim.

```
1 '********************
2 '***   BOMER    ***
3 '*** BY M. LOTT ***
4 '********************
7 BO=35+RND(20):SC=0:COLOR,0
10 POKE30862,80:POKE30863,52:CLS:GOSUB40
00
20 PRINT@73,"[****BOMER****]";
30 T$="( BY MICHAEL G. LOTT )"
40 FORN=1TOLEN(T$):PRINT@133,RIGHT$(T$,N
);:NEXT:SOUND30,1
50 PRINT@289,"[PRESS  >>Y<< FOR INSTRUCT
IONS] ";:E1$=INKEY$
60 E2$=INKEY$:IFE2$=""THEN60
65 SOUND30,1
70 IFE2$="Y"THENGOSUB5000
80 CLS
88 PRINT@266,"[GAME START]"
99 SOUND31,1:SOUND28,3:SOUND30,1:SOUND28
,1:SOUND24,3
100 CLS
110 FORX=485TO505
120 A=RND(8)-1
130 FORP=0TOA
140 C=X-B*32:PRINT@C,"[0]";:NEXT:NEXT
150 PRINT@0,"[???????YOUR HOMETOWN MAYBE
???????]";
155 SOUND20,5:SOUND25,6
156 PRINT@0,"
    ";
200 D=0:FORP=32TO505:IFP=505THEN600
210 COLOR1:PRINT@P," (UTTTZT)";:SOUND5,1
215 PRINT@0,USING"[SCORE]####";SC+F:SC=SC
+F
216 IFBO=0THENPRINT@14,"[OUT OF BOMBS!!!
!]":ELSE218
217 GOTO220
219 PRINT@20,USING"[BOMBS]##";BO
220 IFPEEK(P+28679)=15THENGOTO500
230 IFD<>0THEN300
235 E1$=INKEY$
240 F=0:E2$=INKEY$:IFE2$<>" "ORBO<=OORP>
474THENNEXT
250 COLOR7: G=P+36:BO=BO-1:IFPEEK(G+2867
2)=15THENNF=1
260 COLOR7:PRINT@G,"(J)";:D=1:X=USR(X):N
EXT
300 COLOR7:PRINT@G," ";:G=G+32
310 IFPEEK(G+28672)=15THEN316ELSE315
315 Z9$="(J)":GOTO320
316 F=F+1:Z9$="(Y)"
320 IFF>60ORG>511THEND=0:GOTO230
330 COLOR7:PRINT@G,Z9$;:X=USR(X):NEXT
500 REM
510 PRINT@P,"        ";:PRINT@P-33,"(FG)"
;:PRINT@P-27,"(ED)";
515 PRINT@P-27,"(IG)";
SOUND10,5
525 FORI=1TO750:NEXTI
530 CLS:PRINT@256,"[  PRESS >>>>SPACE<<<
< TO START  ]";
535 E$=INKEY$:IFE$<>" "THEN535ELSERUN
600 PRINT@288,"[YOU HAVE LANDED!!!!!!!!!
!!!!!]":GOSUB3000:CLS
610 GOSUB4000:PRINT@70,"[CONGRATULATIONS
!!!]"
620 PRINT@130,"FOR YOUR COURAGE AND BRAV
ERY"
630 PRINT@162,"YOU ARE AWARDED THE....."
640 PRINT@230,"[THE COMPUTER CROSS]"
650 COLOR2:PRINT@262,"        (J)"
660 PRINT@294,"        (JJJ)"
670 PRINT@326,"         (J)"
680 GOSUB3000
690 FORI=0TO31:SOUNDI,1:NEXT:FORI=30TO0S
TEP-1:SOUNDI,1:NEXT
691 FORI=1TO5000:NEXT
692 GOTO530
3000 SOUND16,3:SOUND11,2:SOUND11,1:SOUND
13,3:SOUND11,3:SOUND0,2
3010 SOUND15,4:SOUND16,4:RETURN
4000 COLOR8:PRINT@0,"(AYYYYYYYYYYYYYYYYY
YYYYYYYYYYYY)";
4010 PRINT@480,"(DTTTTTTTTTTTTTTTTTTTTTT
TTTTTTTT)";
4020 FORN=32TO448STEP32:PRINT@N,"(I)";:P
RINT@N+31,"(U)";:NEXT
4030 PRINT@31,"(S)";:POKE29183,248:RETUR
N
5000 CLS:GOSUB4000
5010 PRINT@72,"[****BOMBER****]";
5020 PRINT@129,"* THE OBJECT IS TO DESTR
OY ALL"
5030 PRINT@161,"* OF THE BUILDINGS WITHO
UT"
5040 PRINT@193,"* USING UP ALL YOUR BOMB
S"
5050 PRINT@225,"* AND TRY TO GET THE MOS
T "
5060 PRINT@257,"* POINTS. YOU LOOK LIKE
THIS"
5070 COLOR1:PRINT@289,"* (UTTTTZT). TO R
ELEASE YOUR"
5080 PRINT@321,"* BOMBS PRESS >>[SPACE]<
<"
5085 PRINT@353,"      [+++++GOOD LUCK+++
++]";
5086 FORI=0TO31:SOUNDI,1:NEXT:FORI=30TO0
STEP-1:SOUNDI,1:NEXT
5090 PRINT@449,"[  PRESS >>>SPACE<<< TO
START  ]";:E1$=INKEY$
5091 E2$=INKEY$:IFE2$<>" ",PRINT@72,"
            "ELSE5095
5092 PRINT@72,"[*INSTRUCTIONS*]";:SOUNDR
ND(10)+20,1:GOTO5091
5095 SOUND30,1:RETURN
```

ATARI

Turtle Race

by Mimi van Wyk

The four coloured Atari turtles hold a race around the screen on the command RACE, each running at a different speed, randomly selected by the computer. The joystick button freezes the action until they are told to RACE again.

```
TO RACE
SETBG  81
SETPN  0  SETPC  0  7
PREPARE
GO
END
```

```
TO PREPARE
PD
TELL  0  FD  190
HOME
TELL  [0  1  2  3]
EACH  [SETY  WHO * 25]
SETH  90
PU
END

TO  GO
TELL 0 SETSP RANDOM 100
TELL 1 SETSP RANDOM 100
TELL 2 SETSP RANDOM 100
TELL 3 SETSP RANDOM 100
TELL [0 1 2 3]
WHEN 3  [SETSP 0]
END
```


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COMMODORE 16

Various Sounds

by Chris Parker

These three short routines simulate the sounds of an explosion, a ray gun, and a police siren. They can be incorporated into your own programs.

```
COMMODORE 16 - EXPLOSION

VOL 4:SOUND 3,150,100

COMMODORE 16 - RAY GUN

VOL 4:SOUND 3,1000,60

COMMODORE 16 - POLICE SIREN

FOR A=1TO8:VOL 4:SOUND 2,500,30:SOUND
2,400,30:NEXT A
```

SHARP

Metric Conversion

by Michael Lott

This will run through all the choices of conversion from Imperial to metric, and ask for a choice. On selection, it will then ask the old measure and display the metric equivalent.

```
10:REM METRIC CONVERSION
12:REM BY MICHAEL LOTT  14:REM 18 JAN 1986
20:WAIT 150             30:BEEP 2
40:PRINT"***METRIC CONVERSION***"
50:PRINT"WHAT DO YOU WISH TO"
60:PRINT"CONVERT?"
70:PRINT"1. ONCES-GRAMS"
80:PRINT"2. POUNDS-KILOGRAMS"
90:PRINT"3. TONS-TONNES"
100:PRINT"4. FLUID OZ-MILLILITRES"
110:PRINT"5. PINTS-LITRES"
120:PRINT"6. GALLONS-LITRES"
130:PRINT"7. FAHRENHEIT-CELSIUS"
140:PRINT"8. INCHES-MILLIMETRES
150:PRINT"9. FEET-METRES"
160:PRINT"10. YARDS-METRES"
170:PRINT"11. MILES-KILOMETRES"
180:PRINT"12. SQ. FEET-SQ. METRES"
190:PRINT"13. ACRES-HECTARES"
200:INPUT"YOUR CHOICE (1-13)?";Z
210:WAIT:IFZ=?THEN400
220:FOR I=1TOZ
230:READA$
240:READB$
250:READC
260:NEXTI
270:PAUSEA$;"?":INPUTD
280:E=D*C
290:PRINTD;" ";A$;"=";E;" ";B$
300:INPUT"IS THAT ALL (Y/N)";F$
310:IFF$="Y"THEN10
320:IFF$="N"THEN340
330:GOTO300
340:END
400:PAUSE"FAHRENHEIT?":INPUTD
410:E=(D-32)*.5556
420:PRINTD;" FAHREN.=";E;"CEL."
430:GOTO300
500:REM *** DATA ***
510:DATA "OUNCES","GRAMS",28.35,"POUNDS",
    "KG",.4535
520:DATA "TONS","TONNES",1.016,"FLUID OZ",
    "MLS.",28.41
530:DATA "PINTS","LITRES",.5680,"GALLONS",
    "LITRES",4.546
540:DATA"","",,"INCHES","MM",25.4,"FEET",
    "METRES",.305,"YARDS"
550:DATA "METRES",.914,"MILES","KM",1.609,
    "SQ FEET","SQ M",.093
560:DATA "ACRES","HECT",.405
```

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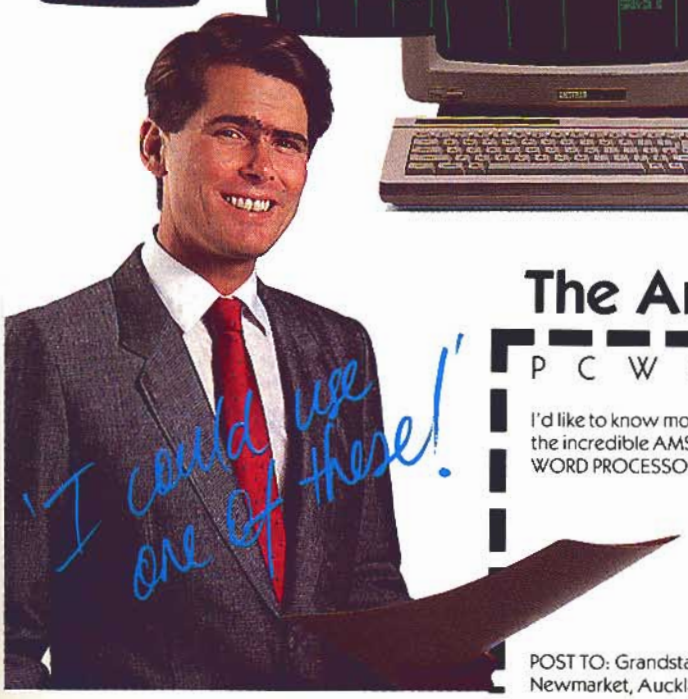

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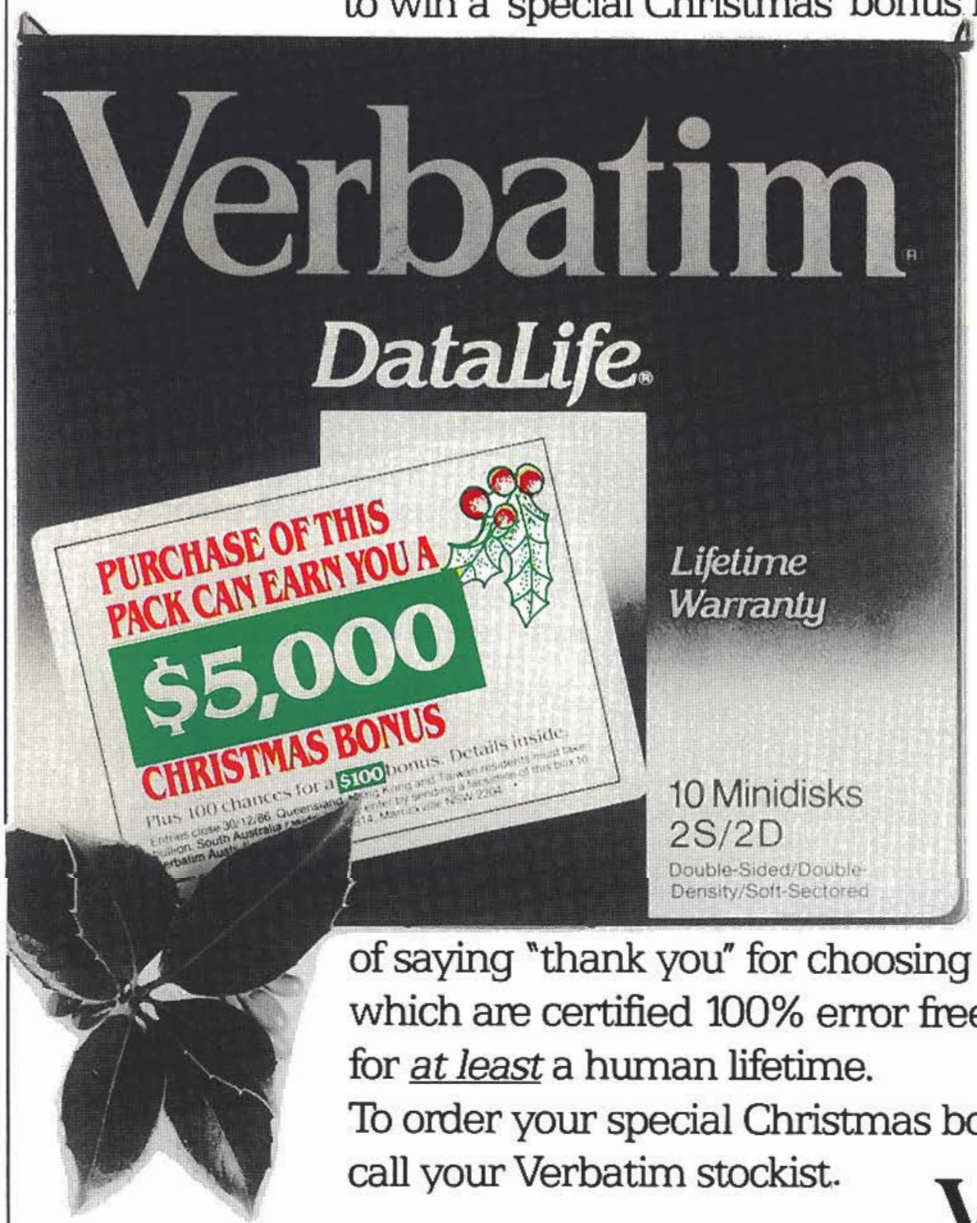

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Modems and monitors

by Geoff McCaughan

Subject: Communications

Q: I have heard that some computers, such as the Apple Macintosh, don't need a modem. Is this true and if so does an Osborne need one?

A: I'm afraid you've heard wrong. If you wish to telecommunicate with a computer you need a modem, and there is no way around it. However, some computers are supplied with a built-in modem (not the Macintosh though). But there is still a problem, as an American computer will most likely be fitted with a modem conforming to the Bell standards. If you try and use one of these in New Zealand you will find: you can't talk to anyone; and the NZPO will be very cross with you. In order to be usable in New Zealand a modem must conform to the CCITT standards and in addition must be NZPO Type Approved if it is of the direct connect type.

So, if you find a computer with a built-in, CCITT, Type Approved modem you are home free, but I think you wil find Osbornes don't come into this category.

To anticipate your next question, Bell type modems can be converted in some cases to CCITT, but at a cost that only really makes it practical if you must have a built in modem (e.g. for portability).

Subject: BASIC string handling
System: Atari 130XE

Q: I have noticed that Atari BASIC lacks String Arrays (MID$, RIGHT$, LEFT$). How can these be compensated for?

A: Before I go any further, a word on terminology. MID$, RIGHT$ and LEFT$ are string functions, and have nothing to do with string arrays. Atari BASIC uses a method of string manipulation which can be summed up by the example:

```
X$ (start,finish) = Y$ (ystart,
   yfinish)
```

Microsoft BASIC would interpret this as a referring to string arrays, but Atari BASIC assigns a substring of Y$ from ystart to yfinish into a substring of X$. This is analogous to MID$ in Microsoft BASIC, except that the substring is assignable, whereas MID$ is not, and none of the Microsoft string functions can appear on the left side of an assignment statement.

Another difference is that Atari BASIC cannot substring a string literal.

```
Y$ = RIGHT$ ("000000",X)
```

would have to be written:

```
Z$ = "000000":Z$ (1,X)
```

Given these differences, any string expression in Microsoft BASIC should be translatable into Atari BASIC, although some of the more complex examples may require some logical juggling.

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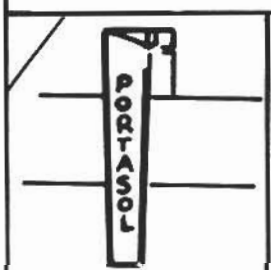

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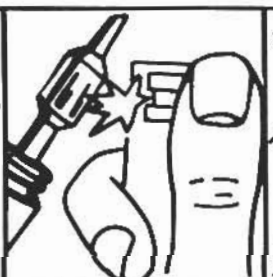
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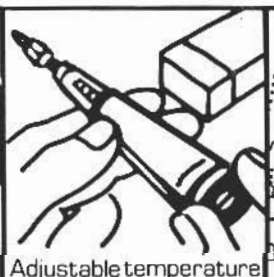
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Subject: Monitors

Q: I understand that a computer monitor is just a TV with some parts removed. If this is true, has there ever been a gadget made that you can plug into your monitor that would allow you to use it as a TV?

A: While it is true that a monitor is a 'TV with bits missing' in the broad sense, this is not strictly true in every case. There are several different categories that monitors can be broken down into, but for the moment let us consider two types of colour monitor, Composite and RGB.

A composite monitor accepts a single PAL video signal which contains all the information required to produce an image. An RGB monitor requires four separate signals (red, green, blue, and sync). The ultimate consideration in video circuitry is bandwidth, which is simply a measure of the ability to handle a broad range of frequencies without degradation. Because of the nature of a composite video signal, the bandwidth is limited to around 5 MHz, regardless of the quality of circuitry you process the signal with, and consequently there is an upper limit on the picture quality one can expect with this type of monitor. RGB has no such limitation, and the quality is limited only by the circuitry generating and processing the signal. RGB monitors can have bandwidths anywhere between 5 and 15 MHz.

There are a host of other features to take into consideration when discussing monitors, but basically it adds up to the more money you spend, the better quality you get. Once you've got your monitor, if you want to use it for a TV (as if there was anything on TV anywhere near as fascinating as programming your computer!) there are one or two possibilities.

Essentially you need to convert the RF signal from the aerial to a video signal compatible with your monitor. In the US one can buy tuners which do just this, but they are no good here because they use the American NTSC encoding system while we use PAL (see Q & A August for more on this). It is possible that such devices exist in Europe which could be usable in New Zealand, but I am not aware of anything available here. The market would be so small that it would be a difficult job convincing anyone to import them.

In the meantime, you can use your VCR as a tuner provided it has a Video Out jack. Most VCRs have these, and all that I have seen have been composite. You will probably find that the reception is better than your usual TV due to the higher quality of the tuner in the VCR and the better video circuitry in the monitor.

Don't just use it for a TV though, as you will also find that the monitor givs brilliant results when you're watching video tapes. I know someone who did this and found the results so good that the monitor is now permanently connected to the VCR while the computer has to make do with a lowly TV.

If you have in mind the possibility of using your monitor as a TV you will probably need to buy a composite model, but if you need RGB for your computer it is possible to get the best of both worlds with a Composite/RGB model. The difference in cost is minor, and well worth the results on your video. One other thing to keep in mind: make sure your monitor has sound, or that you can connect your VCR sound to your stereo, as silent TV is pretty boring. As a general rule a monochrome monitor can be used anywhere a composite monitor can, though I don't think green or amber TV is likely to catch on in a big way.

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LASER PRINTERS

leading edge of printer technology

Review machines: Canon LBP-8 A2 Ricoh LP4080R

by John Slane

From the quill pen to a laser beam. What a giant leap technology has made in methods of transcribing images to paper! It would take a bold person to predict how much further we can go – and what, specifically, the new step up would be.

As a child I looked forward to visiting my father's workplace as he usually let me have a go on the (manual) typewriter in the office. What a miracle it was. Thinking back to that time, I now wonder what the office secretary thought when she arrived the next morning to find the margins, tab sets and line spacing all higgledy-piggledy. No such thing then as default resets.

The first electric typewriters (another miracle) were really just solenoid versions of the standard manuals, but then IBM changed all that with the golf-ball Selectric. For the first time one machine could print in a variety of typefaces and pitches and the un-jammable nature of the mechanism encouraged faster typing speeds.

The daisy wheel was a sideways development of the IBM concept which then moved with new enhancements to become electronic in the current sense of the term.

The early electric (not electronic, yet) typewriters facilitated a quite new possibility – that of being driven by electrical pulses and codes from a perhipheral machine, a computer. I remember being sorely tempted by advertisements in American magazines for a bolt-on device over any electric typewriter keyboard which consisted of solenoid driven pistons that hammered selected keys on command from the computer. Apart from the incredible racket the thing probably made, users were warned not to use any key more than 20 times in succession (underlining?) or that solenoid would burn out!

A dramatically different approach came with dot matrix printers. Do you remember the terrible, nearly illegible print the first ones produced?

Now these printers are achieving great levels of sophistication in both quality and speed of printing. The upper limit of speed will finally be set by mechanical considerations of mass and inertia. Using exactly the same principle as the pin-driven matrix printer, a later development used jets of ink fired through holes where the pins would otherwise be. The ink jet printer is still very respectable and an excellent option for many applications.

And then, along came the Laser.

If my memory serves me correctly, the laser was first taken up by the typesetting industry where digitalised fonts became a practical alternative to optical images, electronic flash, zoom lenses, and oscillating mirrors. Today the most sophisticated (and expensive!) typesetting machines use computer driven lasers to expose photosensitive paper which then has to be processed just like black-and-white photographs. The quality is so good, it takes a strong glass and a keen eye to discern the scanning lines.

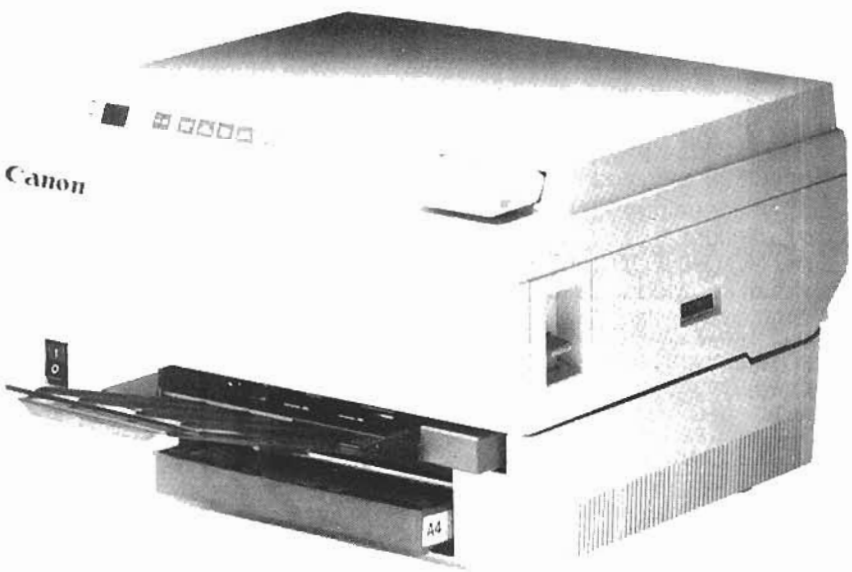
The laser writing technique works on the following general lines:

1. The laser is pulsed on and off according to whether the required image unit is black or white.
2. The beam is reflected off a fast-spinning wheel which is sextangular (or whatever sided the designer chooses), where each of the faces consists of a surface coated mirror. The changing angle of the spinning mirrors causes the deflected laser beam to perform a scanning action.
3. A series of corrective lenses and flat mirrors then deflects the beam to where its effect is finally required. In the case of a photo-typesetter, this will be directly on to light-sensitive paper or film. This is expensive stock, and after processing will usually only be used to create the master art work from which a printing plate is made.

The two samples of laser printers supplied for review are desk top units, with printing output on plain paper. The machines look remarkably like your common old photocopier (or, more strictly speaking, electrostatic copier).

The similarity is not coincidental. These are, in fact, electrostatic copiers.

The needle-sharp laser beam strikes a sensitised, revolving belt or



drum setting up a matrix of electrostatically charged points. The belt then moves to where it is dusted by toner powder which sticks only to the highly charged portions. The pattern of toner images is transferred to a sheet of paper and then permanently fused onto it by the application of heat. Then the paper is ejected into a receiving tray and the copy is finished.

As the belt continues to revolve, residual toner is wiped off and the belt is exposed to a "quenching" light. This flattens all the peak charges and prepares the belt for the reception of a new pattern of electrostatic images. The quenching light performs the same function on the photosensitive medium as the erase head does on a tape recorder.

The diagrammatic description of the process is reproduced from the Owner's Manual with the Ricoh printer.

If your output was a letter to a client, then you probably loaded the input cassette with your firm's letterhead paper. Out comes an immaculately printed letter on your customised paper, ready to be sent straight to the addressee – or your letterhead could have been stored in the printer's memory to be printed as an overlay along with your text (and graphics!).

If you wanted a copy for filing, then you would have set up your output for two copies. Printing of the second copy would add only a few seconds to the time required for printing. The second copy would be as perfect as the first. In fact, the second or third copy wouldn't waste any time at all. In either model, for example, the printer buffer would have soaked up all your text and released the word processor so that you would get straight on with typing the next letter while printing went on in the background.

Alternatively, a command to the printer would automatically cause it to print the number of copies requested. How you sort the multiple copies after printing differs markedly between the two machines, and I'll go into that later.

If you work in a large office, you will be only too familiar with the queues of people waiting to use the new photocopier because it's so much better than the old ones in other locations in the building. Then after a few months, the "new" one is only performing just as well (or badly) as the rest of the units.

A new copier is well set up by the supplier. It performs at optimum level. But from then on, it can only get worse. Degeneration in performance may be due to inadequate maintenance, toner exhaustion or insufficient agitation, belt or drum faults, stray toner through the system or any one of a number of problems.

The point of all this pessimism is that your new laser printer is also susceptible to all these problems, and you can't just leave it to look after itself. After I had run about 200 copies on each machine I noticed a significant degeneration in image contrast, particularly the Ricoh. The demonstration copies I was provided with – having been run off the oldest Ricoh laser in the country – were vastly superior to the copies my machines were presenting.

If you are fussy about quality (I am, as you will have guessed!) then you will need to be scrupulous and regular with routine owner-servicing, and be prepared to call the experts at various times.

To be quite fair, however, the loss of quality I have been describing was generally only noticeable in larger areas of solids, and would not normally be noticed in text printing.

There is only one significant saving grace that is a feature of the laser printer. Because it is not trying to pick up an image by reflecting light bounced back from an original, the electrostatic charges created by the direct laser beam have a huge difference in potential from the non-image areas, giving superb contrast. Thus there is a greatly reduced chance of picking up toner in the white areas.

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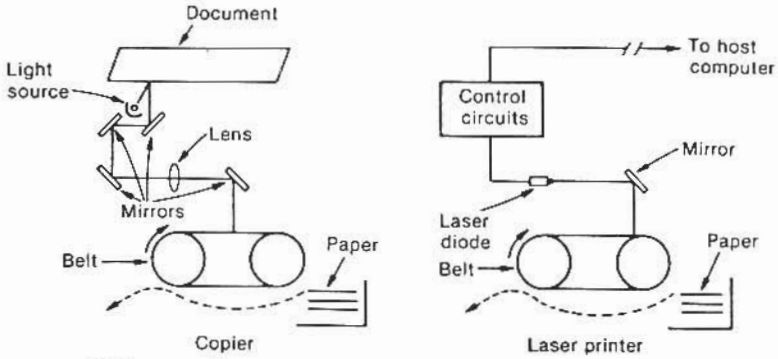

Difference between copying machines and laser printers

To reduce problems to a minimum, both machines are designed with user-replaceable parts. On the Canon, for example, you don't top up the toner reservoir, you replace the whole unit, and the 'unit' consists of just about everything that matters – the photosensitive drum, toner hopper, developing cylinder and drum cleaner. Similarly, Ricoh offers replaceable units including a new photosensitive belt (the 'OPC' unit).

Both machines give signals to the user when replacements on a volume throughput basis are required.

Is this an extravagant and expensive feature? Both machines have a running cost of around 8 cents per page based on the recommended life of the replaceable components. In this connection, have you ever costed carbon ribbon on a per-page basis for a conventional impact printer?

You might be surprised to find that 12 to 18 cents per page is what carbon ribbon is costing you. And that's using a large cartridge. I once reviewed a printer with a small ribbon cartridge and that worked out at 80 cents per full page of characters!

The review machines

Although the Canon LBP-8 A2 and the Ricoh LP4080R are similar in basic principles they are not, strictly speaking, direct competitors for the same application.

The Ricoh is targeted as a word-processing printer and would generally be expected to be producing text output. The Canon has a 1.2Mb built-in memory to absorb many downloaded fonts, and has very sophisticated graphics capabilities including character manipulation and special printing effects. As a reviewer, I found the exploration of the Canon's capabilities of greater interest – but then I also enjoy driving a Mercedes, when I can find someone to lend me theirs!

A standard feature of both printers is their capacity to do a 90 degree rotation of fonts. The Ricoh could rotate all its fonts, but the Canon only selected ones. This rotation is called for when you wish to print in landscape format, ie across the length of the page rather than conventionally across the width (portrait). Some dot matrix printers now also have this capability.

You get an interesting effect when you rotate the orientation but forget to rotate the fonts – Chinese format with English letters!

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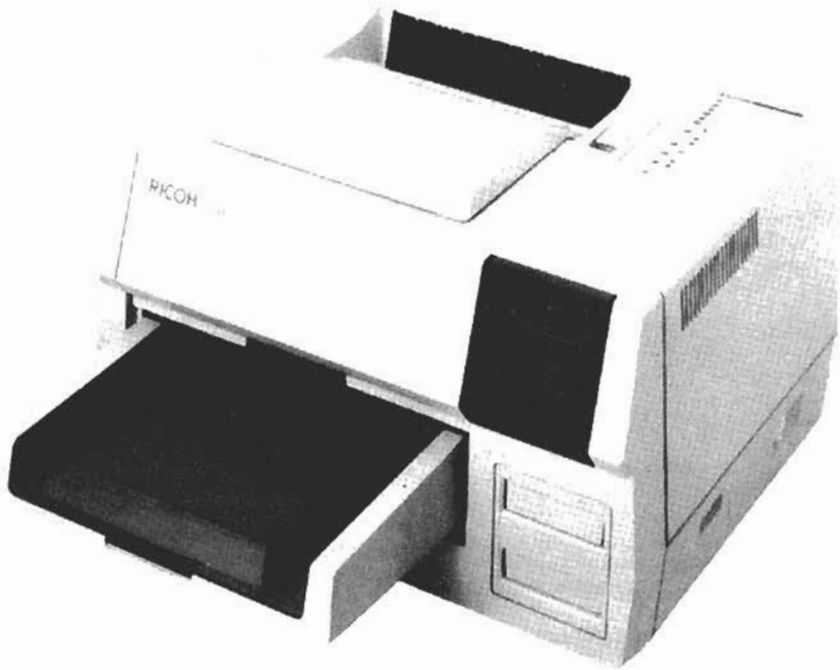

Both printers make provision for plug-in ROM cartridges, each of which may contain 8 different fonts. These will then be additional to the four fonts that are inbuilt. That's 12 different typefaces immediately available under software control. In addition, and depending on the size of the RAM installed, another score or so of fonts can be downloaded from your software package.

That's a lot of fonts, and more than some commercial typesetters have available!

A count of fonts doesn't, however, really tell the full story of what options are available.

On the basis of the Canon and Ricoh calculations a typesetter would say he or she had thousands of fonts available. The difference is due to the laser printer designers' mentality and conservatism that a 'font' is a set of characters that are like those found on a typewriter's golfball or a daisy wheel. The characters are a set size and require a set spacing (pitch) to print satisfactorily.

A typesetting machine is capable of taking any font (which is really the set of parameters of a particular style of print) and printing that font in any size from 7/100" to over 1" high in steps of 1/72" or even 1/144" steps.

My greatest disappointment as I got into this review assignment was the discovery that the potential technology is still hardly being scratched. To use all this awesome power merely to replicate a conventional typewriter (plus graphics capabilities, of course) suggests a development and marketing strategy of little vision.

The machines look remarkably like your common old photocopier

Conservativism extends even to the type faces offered. The majority of these are the same names that are found on the first golfball options – courier, letter gothic, elita, pica, etc., and only occasionally something like helvetica. Where are fonts like eurostile, souvenir, stymie, times roman, chelmsford, linked scripts, and so on? Do customers really just want $12,000 typewriters? Have the better options been offered to them?

Perhaps the answer has nothing to do with built-in or cartridge fonts. Perhaps the laser printer package should be stripped down to the basic engine and driven entirely by software and in graphics mode only from the host computer. Then, and only then, will real "desktop publishing" be converted into reality.

So far I have tried to bring out general characteristics and observations that seem to apply to both the Canon and the Ricoh. However, there are differences, and I'll comment on these as I look separately at each machine.

Canon LBP-8 A2

This looks, and is, a quality machine. It is whisper quiet in operation. I had it only centimetres away from my left ear for hours on end and it proved no distraction at all. Surprisingly, it was not as heavy as the Ricoh, nor as large.

The LBP-8 (Laser Beam Printer) comes in two versions, model A1 and A2. The A2 as reviewed, has 1.125Mb of memory, a vector print mode and a partial or full paint memory mode. It is the option to be chosen if graphics are to be used at a sophisticated level, while the A1, like the Ricoh, is mainly for word-processing applications.

There are six control tabs on its panel and the use of these is quite straightforward. The "Error Skip" enables you to recover from any software hangups (like when I fouled up control codes!).

An unusual feature is the provision of two ways of feeding paper in. One is the usual cassette, which holds 100 sheets at a time. The other is for manual feed and allows use of a greater range of paper thicknesses and oversized or very small sheets. As the entry points are on opposite sides of the machine you have to remember which orientation is required by each input if you are doing back-to-back printing or using pre-printed forms.

Two test print options are available, close spaced vertical lines or an output of ASCII characters of the currently selected font. Neither test tells you much, other than the machine is actually going.

One slot is provided for a ROM cartridge, but of course the memory will absorb many further downloaded fonts from software.

Text is capable of some manipulation: reversed white on black, shadowing (very effective for section headings), and elongation in either or both of two planes. This latter facility is useful for headings but appears to be done by a straight software manipulation of the basic character grid – the larger letters are coarser than the regular sized versions without in-fill to smooth out curves.

The User's Manual is a substantial volume of 206 pages in A5 format. It starts off gently and then gets more and more technical. By the time it gets to describing the software control codes it is intelligible only to people with considerable computer knowledge. It's nice to know the information is there, but your average user will hardly ever refer to it.

As with the Ricoh, the majority of purchasers will expect their software packages to drive the printer without their having to worry about how it is being done.

Ricoh LP4080R

In standby and operation, the Ricoh is a little noisier than the Canon. A look at the inside reveals that the purely mechanical bits such as motors and drives are large and heavy. I'm not in a position to say whether this also means "robust". Most of the standby noise eminates

from the fan air passing through a catalytic filter (to remove ozone). If the filter is removed, the noise drops markedly, but obviously this is not a recommended practice.

This printer's indicators and controls are less sophisticated than the Canon's. Use is made of icons to indicate some of the possible faults, while other specific errors are given by a repeating sequence of numbers in the single digit display. A system hang-up can be cleared only by a soft reset from your host computer, or by pressing the TEST button. There's no other option for a hard reset.

The test function deserves special comment. This causes the printing of an exceptionally useful diagnosis of the printer's current status, complete with pictures of the DIP switch settings and the value/function they presently have.

The available fonts are named (including the ones in RAM, if any) and a test sample of each is given. Any current system errors will also be described. There are other bits and pieces also, the whole attractively laid out and easy to follow. A model test sheet, in my opinion.

Both serial and parellel interfaces are installed.

The paper cassette holds about 250 sheets – and the receiving tray also holds about 250 sheets, a practical and well thought out feature. Paper pickup uses friction rollers lightly touching. The bottom one is tensioned so that if two sheets are picked up, the bottom sheet is discarded back into the cassette. An ingenious idea, it is claimed to be more reliable than conventional pickup systems.

However, there's more to come! If you have printed multiple copies of pages 1, 2 and 3, when you pick them up, they are in order 1,2,3,1,2,3, etc.

It's simple, really. The papers are ejected upside-down, a clever idea that certainly appealed to me, as did the fact that loading of paper is done without removing the cassette and by putting the side you want printed on, face up and front first into the cassette. All very logical.

Paper exits from the top of the printer, so one 90 degree turn is the only manoeuvering required by the sheet.

As with the Canon, four fonts are built-in as standard, while a further four can be added internally. There is provision for two ROM cartridges to be inserted as required (eight fonts per cartridge).

Additionally there is enough memory to download fonts by software, and the specifications say that up to 64 maximum are possible. All the Ricoh fonts can be rotated.

Ricoh makes it quite clear who the manuals are intended for. The User's Manual is for the non-technical person who needs enough knowledge to attend to daily operation and routine servicing. This book is full of large line drawings and a relatively small amount of text.

The Programmer's Manual states specifically that "information contained in this manual is intended for programmers and software users needing to write or modify software." This is a 258-page document and was what I used to explore the printer's capabilities. I also sighted a further Applications Manual which didn't seem to me to cover much that hadn't been covered better in the Programmer's Manual.

Conclusions

Laser printers are up and running. Any firm or individual generating high throughput copy, where speed and quality are important, must consider the laser printer among possible options.

Users won't want to be bothered with working out printer codes so the kinds of printer-specific software packages that are available will be an essential enquiry. In my discussions with representatives of Canon and Datacom I gained the impression that Canon will direct you to Canon versions of common software programs, whereas Datacom will actually customise software interfaces to meet a variety of customer-specific needs.

In both cases, solutions are available, but the costs of those solutions must be counted in with the hardware costs in determining the benefits of acquiring a laser printer.

SUMMARY

Name	Canon LBP-8 A2	Ricoh LP4080R
Type	desk top page printer	
Print method	dry electrographic laser	
Paper	cassette or manual	cassette
Paper tray	100 sheets	250 sheets
Print speed	8 pages/minute	
1st print 18 secs	1st print <20 secs	
WArmup	2 minutes	<120 secs
Duty cycle	not specified	5-15,000 pages/month
Print resolution	300 dpi	
Interface	RS232C, 8-bit parallel	RS232C, Centronics
Dimensions	476(W) x 415(D) x 293(H)	530(W) x 420(D) x 329(H)
Weight	32 kg	37 kg
Price	$7,829 incl GST (next shipment $9,665)	$11,200 plus GST (model A1 $7,620 plus GST)
Distributor	Canon Data Products	Datacom Equipment

5.25" DS/DD FLOPPY DISKS
ONLY $26.00 FOR 10
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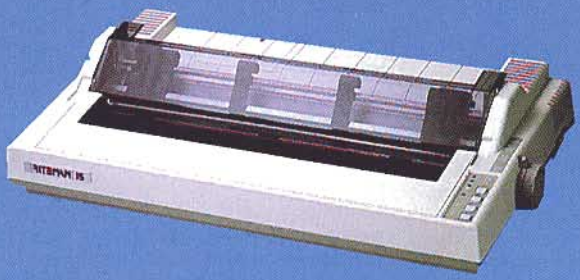
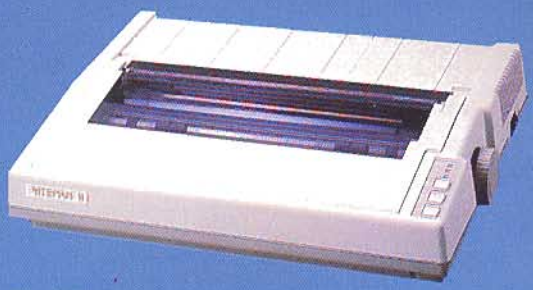
MORE FEATURES FROM NEW RITEMAN PRINTERS

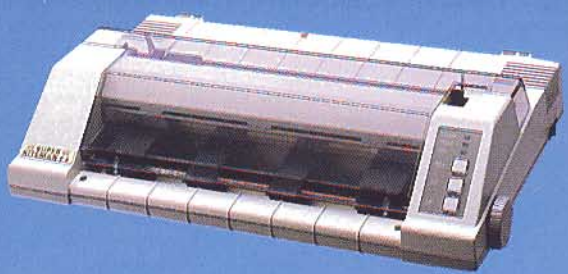


SUPER RITEMAN 15
15" 160 CPS



SUPER RITEMAN 11
10" 160 CPS

MAIN FEATURES: * Front Panel Switch Selection of: NLQ, Draft, Compressed, Expanded, Elite, Emphasised, Italics, Double Strike, Underline, Super Script, Subscript, Skip Perforation. * IBM Graphics Set * Atari 520ST Character Generator * Epson FX85 Emulation (Super Riteman II and Super F+ II) * Epson FX105/185 Emulation (Super Riteman 15) * 8K Ram * Parallel Interface Standard (Serial Optional) * Super F+ II has straight through paper path (ideal for label printing and printing on card) and built in stand. * Tractor and Friction Feed * 12 Month Warranty



Super C+
10" 120 CPS

* Draft and NLQ
* Commodore Interface built in
* Geos compatible
* Straight through paper path and built in stand
* Tractor and Friction Feed
* 12 Month Warranty

Super F+II
10" 120CPS

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Existing versions of R15, RII, Super F+ and C+ can be upgraded to new versions for a cost of $75.00 (incl. G.S.T) this includes:

- Fitting of new Eprom
- Supply of new operations manual
- Fitting of 8K Ram (except C+)
- Testing
- Return freight to user

RITEMAN PRODUCTS ARE AVAILABLE FROM:
Preferred Dealers or N.Z. Distributor:

Warburton Franki

WARBURTON FRANKI. Unit B 192 Wairau Rd. Glenfield Auckland. Private Bag. Takapuna. Ph: 444-2645. TLX: NZ 60893.
WARBURTON FRANKI. Wellington (direct line). Ph: (04) 693-016.

Let there be light!

Future technology in printers

by Steve Shilham

Some religions and philosophies believe that our existence here is one of many and that in our highest "form" we exist purely as light. Perhaps, maybe unwittingly, we have stumbled on the meaning of life, albeit through a search for better weapons and more money. If there is truth in this philosophy perhaps there is hope for us after all, but then again, perhaps we are on the brink of Armageddon for getting to close to...

Light is the new technology. Who would have thought that the all-powerful microelectronics might finally meet its successor in the "shape" of plain old light? After all, it surrounds all of us for the larger portion of the day and always has done, so what have we finally discovered that has given it so much potential? Simply, the ability to control it, to focus it into a useful tool.

It is some years since the announcement of laser technology, and the likely uses seemed to revolve around Star Wars-like weapons and tools with the ability to cut through anything in their path. The reality of this new technology has been quite slow in making any noticeable impact on the market. Only since 1983 have we really seen any evidence in the shape of the Compact Disk or laser etched copy protected software.

Other uses have included bar code readers, light displays surgical instruments and a few other things, but none that the average person could see as likely to cause a revolution. None perhaps, until now with the coming of the laser printer. The change in technology from a conventional printer is so dramatic that it makes the traditional daisy wheel or matrix printer seem like a museum piece. There is no ink, no messy ribbon; and the speed!

Laser printers will be best appreciated by comparisons with a close relative, the photocopier. Indeed, much of the technology behind the copier is similar to the laser printer's, which function by taking their document, drawing or whatever, in the shape of data from the computer's software through a conventional serial or parallel port and, without getting bogged down with technicalities, passing this data onto the scanner. This is where the laser part of the device comes into play.

The next stage is the much talked about "engine" of which there are several different types, and it is this area of the printer that actually resembles the copier by producing the printed image.

That process happens at a speed which only the very fastest conventional printers could hope to keep up with. Typically we are talking in the region of eight A4 sheets per minute. As an indication of how this compares with traditional printers, a 100 cps printer would take in the region of 30 seconds for a single sheet. A laser printer would achieve that in about eight seconds, and the quality!

Try to imagine the very best quality typeset magazine page, with a mix of type styles, lights and bolds, headlines, italics, anything from prestige 8 to helvetica 18, all on the same page. That is only the text capability of the device. Mixed on the same page can be a graph from Open Access and even a plot from Autocad, all produced to a superb resolution. Be warned, once you have experienced using a laser printer, you will never be able to regard a matrix or daisy wheel seriously again.

As with all new technologies, the competition will be fierce with vendors making claim and counterclaim, and as always, the prospective purchaser is left wondering which direction to take. One of the major selling buzz phrases of the moment is based on the life expectancy of the internals. "Duty cycle" will be as much of a confusion to laser printer purchasers as benchmarks are to computer purchasers. The argument extolled by those with a long, or heavy duty cycle machine is that, if it needs services less often, it must be cheaper to run.

It all depends on what one considers to be services, or maintenance. While some types of machine typically quote in the region of 500,000 page life expectancies, others quote 100,000 to 200,000, but some with purportedly longer life expectancies require replacement of major componentry at far earlier stages in their life. Their replacement of consumables varies from 3,000 to 15,000, but again there are hidden extras with these longer cycle machines and one must compare like with like over a period of time, which includes replacement of all consumables, before an accurate comparison can be made.

So to the future. Where can these remarkable devices go to from here? Speed is the essence in the computer industry, so obviously we can expect some moves in this direction. Impact may well continue to lead the way in the arena, with its R&D team currently working on the design of a machine which can produce 50 pages per minute. Before you skip past that last sentence, think about it. Perhaps even watch your present daisywheel slowly hammering its way down the page for a minute or two. Fifty pages a minute is a little more than one second per sheet, a revolution!

Other likely developments (let's stay with the probables, rather than the flights of fantasy for a while) are the incorporation of photocopier and laser printing technology all in one device. Much of the componentry is the same, so it makes sense. Why not perhaps have the device capable facsimile transmission and reception too? Remember, at these kinds of speeds, one device can be shared by many people for many tasks without causing a bottleneck.

This ability to provide for many people's requirements makes these machines ideal for sitting on a Novell type resource sharing network too, so why not expand on this? Bear in mind these devices have a tremendous amount of processing power available. Impact, for example, has two 32 bit 10 Mhz processors. That is more processing power than many multi-user micro and even mini based computers. With all of this power on tap, it might be foreseeable that these machines could swerve as multi-user file server and printer in one, acting as the coordinating centre for the entire network.

From there, who knows? Light and the technology of photons and lasers is only in its infancy, but it is likely that companies researching laser technology will use their expertise to develop other light based devices. There is already talk of photon based computers with the capability of 1000 times the processing power of our present super computers, and the incorporation of laser printing technologies will be the only sensible way of providing the print speed that these devices require.

Light is here to stay! But you knew that anyway. What you probably didn't realise was just quite how revolutionary it was going to become.

PRINTERS

$2000 and under

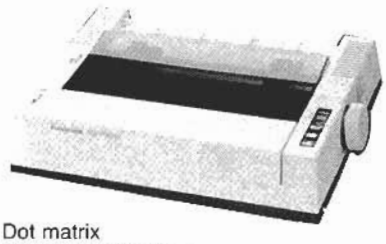
MPS 803

Dot matrix	
Pins in print head:	7
NLQ feature:	No
Print speed:	60 cps
Max chars/line:	80
Paper width:	8.5", 10" with tractor feed
Paper feed:	friction – optional tractor
Buffer size:	one line – 90 bytes
Ribbon type:	fabric
Graphics modes:	text and high resolution
Interface:	serial (Commodore)
Features:	device number select switch allows both 4 and 5 as device numbers; lpi switch with two settings of 1/6", 1/8"
Options:	tractor feed
Retail price:	$469.00
Agents:	Commodore Computer (NZ) Ltd

RITEMAN BLUE PLUS

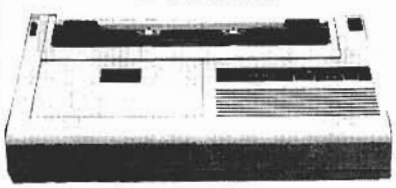
Dot matrix	
Pins in print head:	9
NLQ feature:	No
Print speed:	140 cps
Max chars/line:	132
Paper width:	cut/roll/fan fold 10"
Paper feed:	friction and tractor feed
Buffer size:	2K
Ribbon type:	fabric
Graphics mode:	bit image graphics
Interface:	parallel
Features:	IBM character set
Options:	serial interface
Retail price:	$599.00 (incl. GST)
Agent:	Warburton Franki

PANASONIC KXP1080



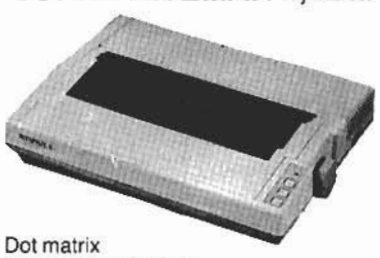
Dot matrix	
Pins in print head:	9
NLQ feature:	yes
Print speed in NLQ mode:	20
Print speed:	100
Max chars/line:	80/132
Paper width:	3" to 10"
Paper feed:	rear tractor feed & friction feed
Buffer size:	1 K
Ribbon type:	nylon cartridge
Graphics modes:	bit image
Interface:	parallel serial option
Features:	operator accessible mode switch, word processing commands, snap in ink ribbon cartridge with built in reservoir
Retail price:	$690.00 plus GST
Agent:	The Microcomputer Electronic Co. Ltd

OKI OKIMATE 20 COLOUR



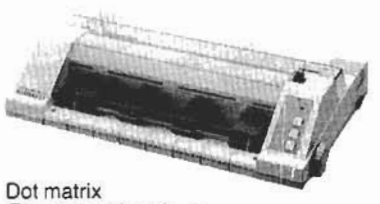
Thermal Heat Transfer	
Pins in print head:	24
NLQ feature:	yes
Print speed in NLQ mode:	40 cps
Print speed:	80 cps
Max chars/line:	137
Point sizes:	5,6,8.5,10,12,17
Paper width:	10 inch
Paper feed:	rear
Buffer size:	8K
Ribbon type:	black colour cartridges
Graphics modes:	APA or block
Interface:	IBM parallel, serial, Commodore
Features:	ribbon less printing utilising thermal paper. Full colour printing
Options:	paper roll holder (thermal)
Retail price:	$699
Agent:	Porterfield Computers, AWA NZ

SUPER RITEMAN II, IBM



Dot matrix	
Pins in print head:	9
NLQ feature:	yes
Print speed in NLQ mode:	32 cps
Print speed:	160 cps
Max chars/line:	132
Paper width:	cut/roll/fan fold 10"
Paper feed:	friction and tractor feed
Buffer size:	8Kb
Ribbon type:	fabric
Graphics modes:	bit image graphics
Interface:	parallel
Features:	front switch selectable; draft, NLQ, compressed, expanded, elite, italics, double strike, underline, superscript, sub script, skip perforation, 253 Atari chars
Options:	serial interface
Retail price:	$699.00 (incl. GST)
Agents:	Warburton Franki

RITEMAN SUPER C +



Dot matrix	
Pins in print head:	9
NLQ feature:	yes
Print speed in NLQ mode:	22 cps
Print speed:	120 cps
Max chars/line:	132
Paper width:	cut/roll/fan fold/ card 10"
Paper feed:	friction and tractor feed
Buffer size:	1 line
Ribbon type:	fabric
Graphics modes:	bit image graphics
Interface:	serial (Commodore)
Features:	Commodore and Epson compatible, front loading, straight through paper path, front switch selectable NLQ
Retail price:	$749.00 (incl. GST)
Agent:	Warburton Franki

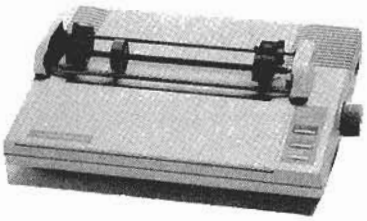
PRINTERS

$2000 and under

SILVER REED EXP 420

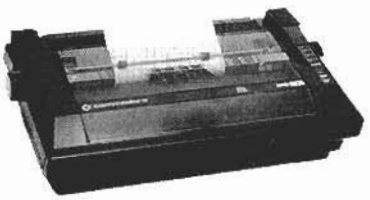
Daisy wheel
- Print speed: 12 cps
- Max chars/line: 82 cpl (10 pitch) 98 cpl (12 pitch)
- Paper width: 11.8"
- Paper feed: friction
- Ribbon type: multistrike or fabric
- Interface: parallel and serial
- Features: small size
- Options: forms tractor and cut sheet feeder
- Retail price: $749.00 (incl. GST)
- Agent: Warburton Franki

MPS 1000



Dot matrix
- Pins in print head: 9
- NLQ feature: Yes
- Print speed in NLQ mode: 20 cps
- Print speed: 137 cps
- Max chars/line: 37
- Paper width: 10" max
- Paper feed: friction and tractor
- Buffer size: one line
- Ribbon type: fabric
- Graphics modes: text and high resolution
- Interface: serial and Centronics
- Features: bi-directional printing, device selection via dip switch, IBM mode.
- Options: cut sheet feeder
- Retail price: $795.00
- Agents: Commodore Computer (NZ) Ltd

DPS 1101

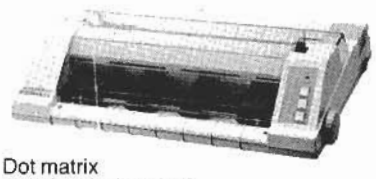


Daisy wheel
- Print speed: 17 cps
- Max chars/line: 220
- Paper width: 13" max
- Paper feed: friction
- Buffer size: 1K
- Ribbon type: IBM 82 typewriter ribbon
- Interface: serial (Commodore)
- Features: drop-in type daisy wheel, Triumph-Adler compatible wheel, 110/132/165 proportional column printing, underscore bold/shadow, back ward printing
- Retail price: $795.00
- Agent: Commodore Computer (NZ) Ltd

LOGITEC FT-5002

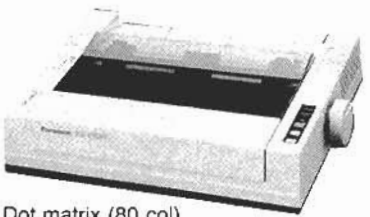
Dot matrix
- Pins in print head: 9
- NLQ feature: yes
- Print speed in NLQ mode: 22 cps
- Print speed: 120 cps
- Max chars/line: 137
- Paper width: cut/roll/fanfold 10"
- Paper feed: friction and tractor feed
- Buffer size: 1K
- Ribbon type: fabric ribbon
- Graphic modes: bit image graphics
- Interface: parallel
- Features: front panel selectable draft, NLQ and proportional modes, automatic sheet feed function
- Options: serial interface
- Retail price: $799.00 (incl. GST)
- Agent: Warburton Franki

RITEMAN SUPER F + IBM II



Dot matrix
- Pins in print head: 9
- NLQ feature: yes
- Print speed in NLQ mode: 22 cps
- Print speed: 120 cps
- Max chars/line: 132
- Paper width: cut/roll/fan fold/ card 10"
- Paper feed: friction and tractor feed
- Buffer size: 8Kb
- Ribbon type: fabric
- Graphics modes: bit image graphics
- Interface: parallel
- Features: front switch selectable; draft NLQ, compressed, expanded, elite, italics, double strike, underline, superscript, subscript, skip perforation, 253 Atari chars, IBM graphics; front loading, straight through paper path
- Options: serial interface
- Retail price: $799.00 (incl. GST)
- Agent: Warburton Franki

PANASONIC KXP1091



Dot matrix (80 col)
- Pins in print head: 9
- NLQ feature: yes
- Print speed in NLQ mode: 29 cps
- Print speed: 120 cps
- Max chars/line: 80/132
- Paper width: 4" to 10"
- Paper feed: adjustable rear tractor and friction feed
- Buffer size: 1K
- Ribbon type: nylon
- Graphics modes: bit image
- Interface: parallel standard, serial interfaces optional
- Features: operator accessible mode switch (standard PGM, NLQ, comp), bi-directional logic seeking printer,
- Options: RS-232 interfaces for Apple 11c & Macintosh
- Retail price: $850.00 plus GST
- Agent: The Microcomputer Electronic Co. Ltd.

PRINTERS

$2000 and under

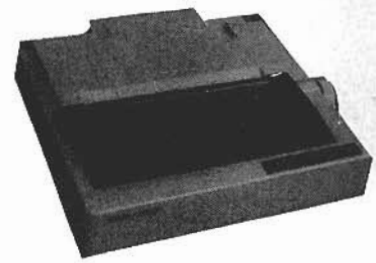
CITIZEN 120D

Dot matrix
Pins in print head: 9
NLQ feature: yes
Print speed in
NLQ mode: 25 cps
Print speed: 120 cps
Max chars/line: 136 in compressed mode
Paper width: 3.5-10 inch
Paper feed: push feed tractor, revolving platen
Buffer size: 4K
Ribbon type: multistrike
Grahics modes: Multiple graphics resolution, IBM or Epson compatible. Switch selectable.
Interface: Centronics – style 8 – bit parallel
Features: B/W reverse image print; paper out sensor. Bidirectional in text mode;
Options: RS232C serial interface
Retail price: $890
Agent: Datacom Equipment

STAR NX10-C

Dot matrix
Pins in print head: 9
NLQ feature: Yes
Print speed in
NLQ mode: 30 cps
Print speed: 120 cps
Max chars/line: 136
Paper width: 10" max
Paper feed: friction and tractor
Buffer size: one line
Ribbon type: fabric
Interface: serial (Commodore)
Features: easy access format switches, two self test modes hex dump mode, micro feeding (forward and backwards), margin setting from control panel
Options: automatic sheet feeder
Retail price: $895.00
Agent: Commodore Computer (NZ) Ltd

STAR NX-10/15

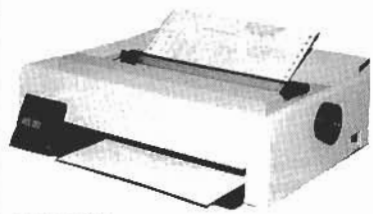


Dot matrix
Pins in print head: 9
NLQ feature: yes
Print speed in
NLQ mode: 30 cps
Print speed: 120 cps
Max chars/line: 132
Paper width: 10 inch
Paper feed: push tractor and friction standard
Buffer size: 5K
Ribbon type: cartridge (refillable)
Graphics modes: 52 IBM graphics characters + 81 special characters
Interface: parallel
Features: Auto paper feed,
Options: Single bin cut sheet feeder. Serial interface (model NL-10)
Retail price: $920
Agent: Genesis Systems Ltd

EPSON LX-86

Dot matrix
Pins in print head: 9
NLQ feature: yes
Print speed in
NLQ mode: 25 cps
Print speed: 120 cps
Max chars/line: 160 (20 chars inch)
Paper width: cut sheet: 182-216 mm Fanfold: 101-254 mm
Paper feed: friction
Buffer size: 1K
Ribbon type: multistrike
Graphics modes: IBM & international character sets
Interface: standard: Centronics optional: RS-232C serial
Features: word processing capability, bi-directional printing, touch select control panel
Options: single bin csf, tractor unit & paper holder
Retail price: $1052
Agents: MDL New Zealand

IBM 4201 PROPRINTER



Dot matrix
Pins in print head: 9 wire dot matrix
NLQ feature: yes
Print speed in
NLQ mode: 40 cps
Print speed: 200 cps
Max chars/line: 136
Paper width: 11" single
Paper feed: integrated front-load for envelopes and cut sheets; continuous forms feed
Buffer size: 2K (5K expansion optional)
Ribbon type: nylon fabric
Graphics modes: 240 x 144 dpi APA
Interface: parallel (serial optional)
Features: easy envelope/single sheet handling, through front-load sheet feed; tractor-standard
Options: asynchronous serial interface, 5K printer buffer expansion
Retail price: $1177 (excl. GST)
Agents: IBM New Zealand

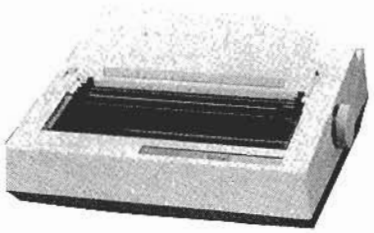
CITIZEN MSP-10

Dot matrix
Pins in print head: 9
NLQ feature: yes
Print speed in
NLQ mode: 32 cps
Print speed: 160 cps
Max chars/line: 136 in compressed mode
Paper width: 4-10 inch
Paper feed: push feed tractor, revolving platen
Buffer size: 1K
Ribbon type: multistrike
Grahics modes: Multiple graphics resolution, IBM or Epson compatible. Switch selectable.
Interface: Centronics – style 8 – bit parallel
Features: B/W reverse image print; built-in push feed tractor; paper out sensor, character sets switch selectable; full duty cycle; prints graphs/diagrams; short tear-off mechanism; bi directional in text mode; hexadecimal byte format in text printing
Options: 8k buffer; RS232C serial interface
Retail price: $1331
Agent: Datacom Equipment

PRINTERS

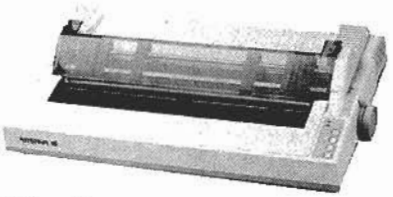
$2000 and under

PANASONIC KXP1092



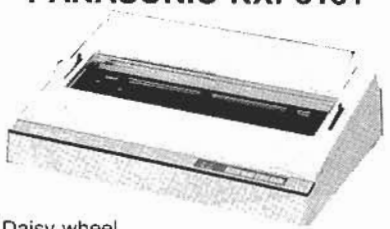
Dot matrix (80 col)
Pins in print head: 9
NLQ feature: yes
Print speed in NLQ mode: 33 cps
Print speed: 180 cps
Max chars/line: 80/132
Paper width: 4" to 10"
Paper feed: rear push tractor and friction feed
Buffer size: 7K
Ribbon type: nylon 3 million char re-ink reservoir
Graphic modes: bit image, block
Interface: parallel standard, serial optional
Features: operator accessible print mode switch (5 print modes),
Options: RS-232 interface for Apple 11c and Macintosh
Retail price: $1360 plus GST
Agent: The Microcomputer Electronic Co. Ltd

SUPER RITEMAN 15 IBM



Dot matrix
Pins in print head: 9
NLQ feature: yes
Print speed in NLQ mode: 32 cps
Print speed: 160 cps
Max chars/line: 233
Paper width: cut/roll/fan fold 15"
Paper feed: friction and push/pull tractor
Buffer size: 8K
Ribbon type: fabric
Graphics modes: bit image graphics
Interface: parallel
Features: front switch selectable; draft, NLQ, compressed, expanded, elite, italics, double strike, underline, superscript, sub script, skip perforation, IBM graphics, 253 Atari chars
Options: serial interface
Retail price: $1,459.00 (inc. GST)
Agents: Warburton Franki

PANASONIC KXP3151



Daisy wheel
Print speed: 22 cps (10 pitch shannon text)
Max chars/line: 132 chrs (10 pitch), 158 chrs (12 pitch) 198 (prop.spacing)
Paper width: 16.5"
Paper feed: standard priction; optional bi-directional tractor
Buffer size: 7K exp to 55K with option
Ribbon type: multistrike 220,000 chrs
Interface: Centronics parallel standard, RS-232 optional
Features: Bi-directional printing; logic seeking; Diablo printwheel & ribbon cartridge compatibles
Options: RS-232 interfaces 148K buffer, bi-directional tractors
Retail price: $1,500 plus GST
Agent: The Microcomputer Electronic Co. Ltd.

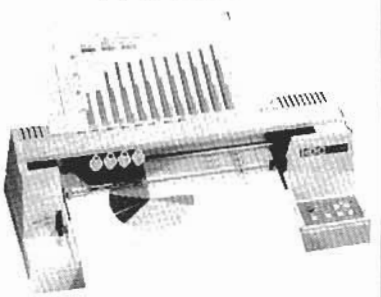
IBM 3852 COLOUR JETPRINTER

Ink jet (drop on demand)
Print speed: bi-directional. from 20cps for nlq in 10 pitch to 50 cps for draft quality in 16.7 pitch
Max chars/line: 133
Paper width: max print line 8" (203mm)
Paper feed: integrated pin-feed for continuous forms manual feed for cut sheets & transparencies
Buffer size: 2K software buffer also available
Ribbon type: ink cartridge
Graphics modes: all-points-addressable 800 dpi
Interface: IBM PC parallel
Features: 7-colour; text and all-points addressable graphics; nlq; document-on-demand; choice of character sets; prints on paper and also directly onto IBM transparency sheets for overhead projectors
Retail price: $1598 (excl. GST)
Agent: IBM New Zealand Ltd

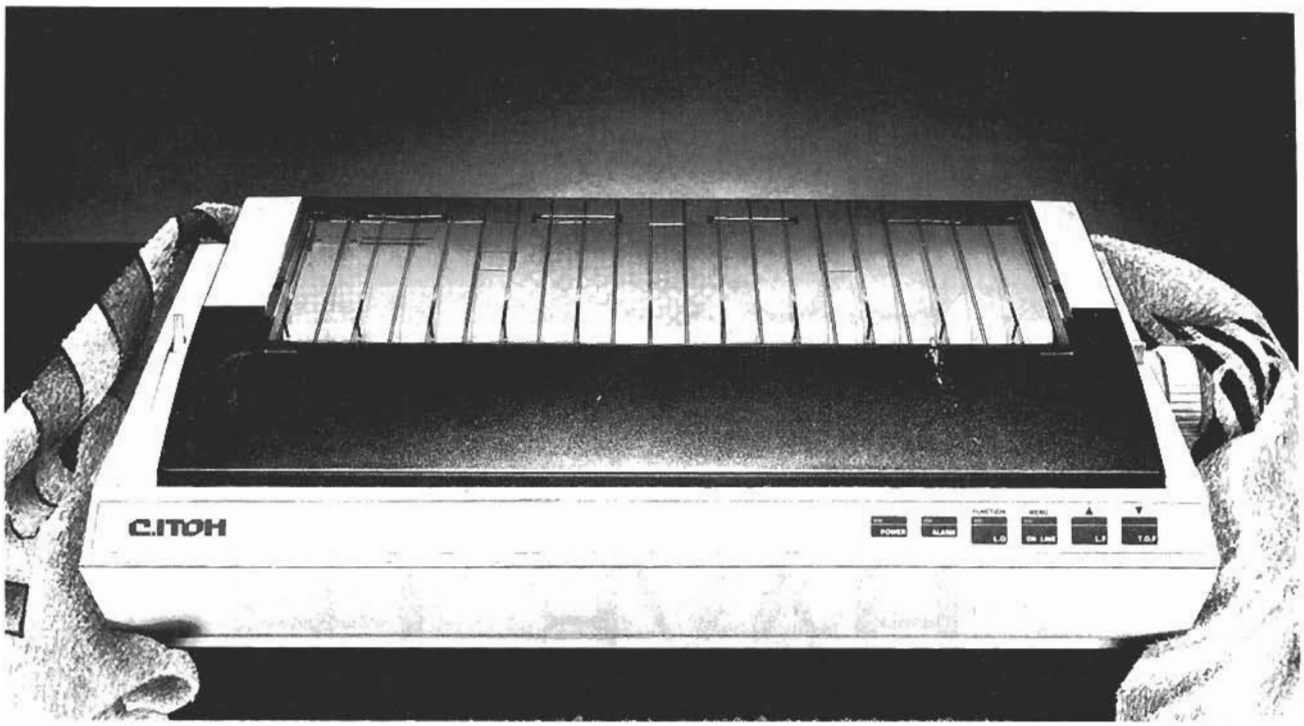
PANASONIC KXP1592

Dot matrix
Pins in print head: 9
NLQ feature: yes
Print speed in NLQ mode: 38 cps
Print speed: 180 cps
Max chars/line: 132/256
Paper width: 4" to 15.5" fanfold single sheet 7.25 to 16.5"
Paper feed: adjustable rear push tractor feed & friction feed, bottom feed option
Buffer size: 7K text buffer
Ribbon type: nylon 3 million char re-ink reservoir
Graphics modes: block, bit image
Interface: parallel standard, serial optional
Features: High throughput printing with white spacing; NLQ printing in all pitches;
Options: RS-232 serial interface,
Retail price: $1,720.00 plus GST
Agent: The Microcomputer Electronic Co. Ltd.

KANTO DENSHI FPL-2000



4 pen printer/plotter
Print speed: 5 cps or 200 mm/sec. plotting speed
Paper width: up to A3
Paper feed: friction
Interface: parallel and serial
Features: A3, A4 size, 4 pen holder
Retail price: $1,799.00 (incl. GST)
Agent: Warburton Franki



TRIATHLETE!

Data processing – NLQ – Letter Quality
C.Itoh's new C-315 printer.
Speed, versatility and endurance.

Teamed with your IBM-PC, compatible or minicomputer, the **C-315** prints at a blistering 87 full lines per minute (250cps) in data processing mode. And gives C.Itoh's renowned clear print quality. In near-letter-quality mode it hums along at 50cps. And letter quality mode produces a smart 33cps – all with logic seeking bi-directional printing.

Three-way paper feed with autoloading.

1. Bottom feed with pull out tractor.

2. Push in tractor feed allows output to be torn off 1" above the print head – perfect for invoices.

3. Friction feed of letterheads while tractor holds sprocketed paper.

Optional 1 or 2-bin Automatic Sheet Feeders. Set up is by printed menus not DIL switches. And its "quiet level" is only 55dBA.

Invest in colour!
C.Itoh's **C-315C,** gives you vivid 7 colour printing for crisp, accurate charts and graphics from 1-2-3, Symphony etc. It costs little more and converts to black and white automatically when the standard ribbon cartridge is used.

Compact models too.
The C.Itoh **C-310** with 10" wide paper feed has all the same features for letter size printing. If your business needs an all-round printer with the speed, versatility and endurance to win – put the C.Itoh **C-310** or **C-315** "Triathlete" to the test.
For the name of a dealer near you contact:

CONTROL

PO BOX 68-474 AUCKLAND. NZ TELEX NZ 61102 'DATASYS'
45 NORMANBY ROAD. MT EDEN. AUCKLAND 3. PH (09) 600-687

WHY WAIT FOR A COPY WHEN YOU CAN HAVE THE ORIGINAL

In 1983 Canon technology triumphed again with the world's first laser beam printer. Since then a few people have tried to copy us.

But you know how it is with copies – no matter how good they are, they never quite match the original.

Canon
COMPUTER SYSTEMS

CLIP THE COUPON OR CONTACT US DIRECT!

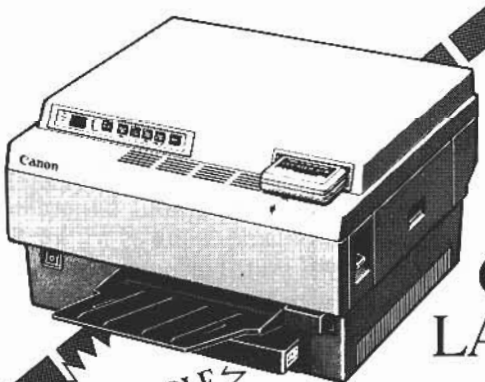
I'd prefer the original. Please contact me immediately.

Name: _____

Address: _____

_____

Phone No: _____



AVAILABLE NOW!

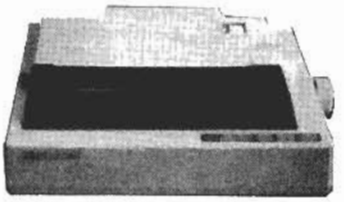
CANON LBP-8A1 LASER BEAM PRINTER

Canon Data Products. A Division of Kerridge Odeon Business Equipment Ltd. 10-14 Como St, Takapuna, PO Box 2191, Auckland. Phone: (09) 492-176. Majoribank St, PO Box 9548, Wellington. Phone: (04) 850-449. **Dealer enquiries welcome.**

PRINTERS

$2000 and under

STAR ND-15

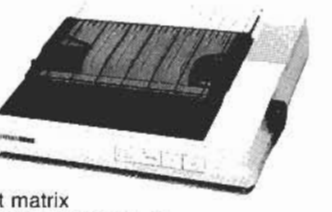


Dot matrix	
Pins in print head:	9
NLQ feature:	yes
Print speed in NLQ mode:	45 cps
Print speed:	180 cps
Max chars/line:	233
Paper width:	15.5 inch
Paper feed:	Push tractor + friction standard
Buffer size:	16K
Ribbon type:	cartridge (refillable)
Graphics modes:	52 IBM graphics + 81 special characters
Interface:	Parallel
Features:	Auto paper feed, front panel control enables, NLQ select, print pitch, margin setting, forward + reverse micro feed, Hex dump
Options:	Cut sheet feeder, serial interface
Retail price:	$1800
Agents:	Genesis Systems Ltd

CITIZEN MSP-15

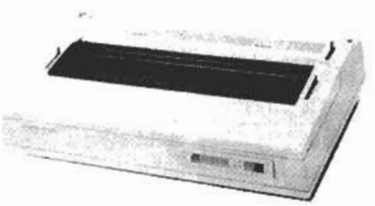
Dot matrix	
Pins in print head:	9
NLQ feature:	yes
Print speed in NLQ mode:	40 cps
Print speed:	160 cps
Max chars/line:	231 in compressed mode
Paper width:	4-16 inch fanfold; 4-15 in pre-cut
Paper feed:	push feed tractor, revolving platen
Buffer size:	1K
Ribbon type:	Multistrike
Graphics modes:	Multiple graphics resolution, IBM or Epson compatible, Switch selectable
Interface:	Centronics – style 8 – bit parallel
Features:	B/W reverse image print; built-in push-feed tractor; paper out sensor; character sets switch selectable; full duty cycle; prints graphs/diagrams; short tear-off mechanism; bidirectional in text mode; hexadecimal byte format in text printing
Options:	8k buffer; RS232 serial interface
Retail price:	$1811
Agent:	Datacom Equipment

CITIZEN MSP-20



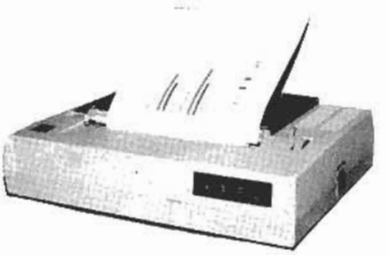
Dot matrix	
Pins in print head:	9
NLQ feature:	yes
Print speed in NLQ mode:	50 cps
Print speed:	200 cps
Max chars/line:	136 in compressed mode
Paper width:	4-10 inch
Paper feed:	push feed tractor, revolving platen
Buffer size:	8K
Ribbon type:	Multistrike
Graphics modes:	Multiple graphics resolution, IBM or Epson compatible, Switch selectable
Interface:	Centronics – style 8 – bit parallel
Features:	B/W reverse image print;
Options:	RS232C serial interface
Retail price:	$1811
Agent:	Datacom Equipment

SILVER REED EXP 600



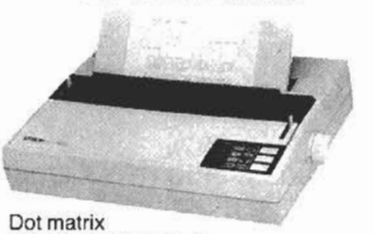
Daisy wheel	
Print speed:	25 cps
Max chars/line:	132 cpl (10 pitch) 158 cpl (12 pitch) 197 cpl (15 pitch)
Paper width:	17"
Paper feed:	*friction*
Buffer size:	3KB
Ribbon type:	multistrike or fabric
Interface:	serial, parallel or IEEE
Features:	interchangeable interface
Options:	tractor feed or cut sheet feeder, 9KB/ 40KB buffer
Retail price:	$1,999.00 (incl. GST)
Agent:	Warburton Franki

PHILIPS P2906



Dot matrix	
Pins in print head:	9
NLQ features:	yes
Print speed in NLQ mode:	40 cps
Print speed:	160 cps
Max chars/line:	137 at 17 cpi
Point sizes:	5,6,8.5,10,12,17 cpi
Paper width:	250mm
Paper feed:	friction, tractor
Buffer size:	1Kb
Ribbon type:	multistrike
Graphics modes:	Epson compatible
Interface:	parallel Centronics/ Serial RS232
Retail price:	from $2000.00
Agent:	Philips New Zealand

EPSON EX800

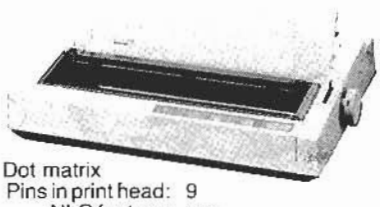


Dot matrix	
Pins in print head:	9
NLQ feature:	yes
Print speed in NLQ mode:	50/60 cps
Print speed:	300 cps Elite, 250 cps Pica
Max chars/line:	*80*
Paper width:	10 inches
Paper feed:	friction/tractor, built in back feed
Buffer size:	8K
Ribbon type:	carbon
Graphics modes:	yes
Interface:	standard Centronics/ serial DIN
Features:	colour adaptable, IBM compatible short tear off bar, auto sheet load
Options:	colour kit, user installable, single bin cut sheet feeder, identity modules, font modules
Retail price:	$2110 (pre-GST)
Agents:	Microprocessor Developments Ltd

PRINTERS

$2000 and under

PANASONIC KXP1595



Dot matrix
Pins in print head: 9
NLQ feature: yes
Print speed in
NLQ mode: 51 cps
Print speed: 240 cps
Max chars/line: 182/256
Paper width: fanfold 4" to 15.5" single sheet 4" to 16.5"
Paper feed: rear adjustable push tractor & friction feed
Buffer size: 15K text buffer
Ribbon type: mylar cartridge 3 million char
Graphic modes: bit image, block graphics
Interface: RS-232 serial & parallel interfaces standard, operator selectable
Features: high speed white spacing of 360 cps
Options: auto cut sheet feeder bottom feed tractor,
Retail price: $2,180.00 plus GST
Agent: The Microcomputer Electronic Co. Ltd

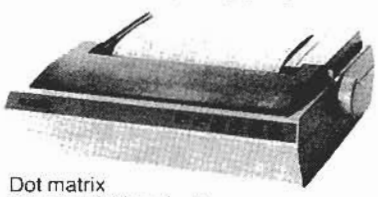
C.ITOH 1550S

Dot matrix
Pins in print head: 9
NLQ feature: yes
Print speed in
NLQ mode: 30
Print speed: 180cps/65lpm
Max chars/line: 136 at 10cpi, 231 at 17cpi
Paper width: 4.5-16 inch
Paper feed: push tractor, friction
Buffer size: 2K
Ribbon type: inked fabric cartridge
Graphics mode: C.ITOH graphics up to 144(V) x 160 (H) dpi or Epson/IBM graphics
Interface: Centronic parallel or RS232-C
Retail price: parallel $2195.00 RS-232C $2250.00
Agent: Control Micro-computers

PHILIPS P2907

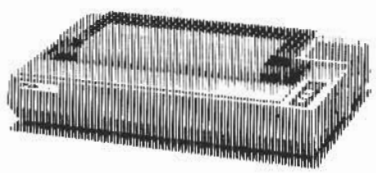
Dot matrix
Pins in print head: 9
NLQ feature: yes
Print speed in
NLQ mode: 40 cps
Print speed: 160 cps
Max chars/line: 233 at 17 cpi
Point sizes: 5,6,8.5,10,12,17 cpi
Paper width: 400mm
Paper feed: friction, tractor
Buffer size: 1Kb
Ribbon type: multistrike
Graphics modes: Epson compatible
Interface: parallel Centronics/ Serial RS232
Retail price: from $2300.00
Agents: Philips New Zealand Ltd

C.ITOH C310



Dot matrix
Pins in print head: 9
NLQ feature: yes
Print speed in
NLQ mode: 50cps, LQ-30cps
Print speed: 250cps-131lpm
Max chars/line: 80 at 10cpi - 144 condensed
Paper width: 4.5-10 inch
Paper feed: rear push tractor/ bottom – pull tractor/ friction sheet
Buffer size: 8K
Ribbon type: inked fabric cartridge black or 7 colour
Graphics modes: C.ITOH or Epson/ IBM graphics up to 240DPI (H) x 216DPI (V)
Interface: Centronics parallel and RS-232-C
Features: colour models can also use standard black ribbon cartridge.
Options: single/2 bin auto sheet feeder,
Retail price: parallel $2250.00 RS-232-C $2250.00
Agent: Control Micro

EPSON FX105

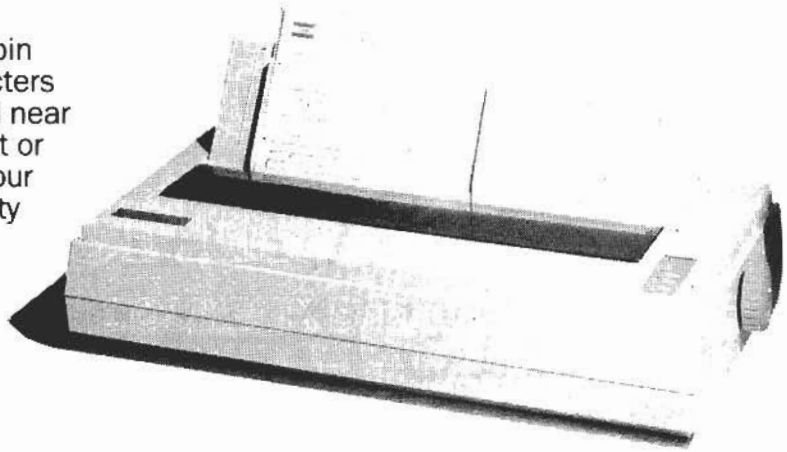


Dot matrix
Pins in print head: 9
NLQ feature: yes
Print speed in
NLQ mode: 30 cps
Print speed: 160 cps
Max chars/line: 132
Paper width: 15 inches
Paper feed: friction/tractor.
Buffer size: 8K
Ribbon type: carbon
Graphics mode: Epson and IBM graphics
Interface: standard Centronic
Features: front panel font selection IBM compatibility
Options: cut sheet feeder
Retail price: $2300 (pre-GST)
Agent: Microprocessor Developments Ltd

STAR NR-15

Dot matrix
Pins in print head: 9
NLQ feature: yes
Print speed in
NLQ mode: 60 cps
Print speed: 240 cps
Max chars/line: 233
Paper width: 15.5"
Paper feed: tractor/friction push feed
Buffer size: 16K
Ribbon type: cartridge (refillable)
Graphics modes: 52 IBM block graphics characters 81 IBM special
Interface: parallel, serial *optional*
Features: auto paper feed, front panel control for NLQ select print pitch, margin setting, forward and reverse micro feed hex dump
Options: single and dual bin paper feeder, serial interface RS232C
Retail price: $2450
Agent: Genisis Systems Ltd

This is the Fujitsu DX 2100 9 pin printer which runs at 44 characters per second, produces draft and near letter quality print, can be sheet or continuous fed, will print in colour and is renowned for its reliability and quiet operation.



This is the Fujitsu M3043 band printer which runs at 1200 lines per minute and produces the best quality print (even through 6 part forms). The M3043 provides the speed and unattended reliability to produce large quantities of printed material economically.

The **M3043** is the biggest printer in the Fujitsu range — the **DX2100** the smallest. Between the two are a whole stable of printers to match your requirements. Dot matrix 9 and 24 pin, Daisywheel, band printers, sheet fed, continuous fed, colour options. Fujitsu can provide them all.

Phone Ian Young of Thorn EMI and talk Fujitsu printers. You'll be pleased with the choice, the reliability and the service.

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THORN EMI

THORN EMI TECHNOLOGY N.Z. LTD

190 Great South Road, Remuera.
P.O. Box 74-018, Market Road, Auckland.
Telephone (09) 545-144

TCC 13012

GENISIS SYSTEMS LTD

WISH TO APOLOGISE TO ITS DEALERS AND CUSTOMERS FOR NOT APPEARING IN THE FIRST ISSUE OF THE BITS & BYTES PRINTER ROUNDUP

THE COMPLETE STAR* RANGE CAN BE SEEN IN THIS ISSUE.

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P.O. Box 6255, Auckland.

Distributed in Australia by:
Genisis Systems Pty Ltd.,
26 Norton Street,
Leichhardt 2040.
N.S.W. Australia.

PRINTERS $2000 +

CITIZEN MSP-25

Dot matrix
Pins in print head: 9
NLQ feature: yes
Print speed in
NLQ mode: 50 cps
Print speed: 200 cps
Max chars/line: 136 in compressed mode
Paper width: 4 to 16 in fanfold; 4 to 15 in pre-cut
Paper feed: push tractor
Buffer size: 8K
Ribbon type: multistrike
Graphics modes: multiple graphics resolution, IBM or Epson compatible.
Interface: Centronics – style 8 – bit parallel
Features: B/W reverse image print; character sets switch selectable: prints graphs/diagrams; bidirectional in text mode;
Options: RS-232 serial interface
Retail price: $2,500
Agent: Datacom Equipment

PHILIPS P5360

Daisywheel
Print speed: 40 cps
Max chars/line: 163 (Elite Pitch)
Point sizes: 10,12,15
Paper width: 400mm
Paper feed: friction, tractor
Buffer size: 2Kb
Ribbon type: carbon
Interface: Serial RS232
Features: precision printwheel control, aluminium diecast integral frame, automatic self-test, automatic print pressure control
Options: single sheet handler, dual bin feeder
Retail price: from $2,500.00
Agents: Philips New Zealand Ltd

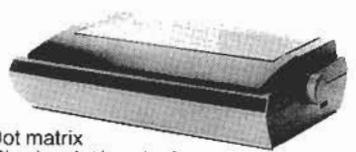
STAR NB-2415

Dot matrix
Pins in print head: 24
NLQ feature: letter quality
Print speed in
NLQ mode: 70 cps
Print speed: 200 cps
Max chars/line: 233
Paper width: 15.5"
Paper feed: push tractor and friction feed standard
Buffer size: 16k
Ribbon type: cartridge (refillable)
Graphic modes: 52 IBM graphics plus 81 special characters
Interface: parallel
Features: auto paper feed, front panel control for selection LQ or draft hex dump, reverse and forward micro feed, print pitch, margin setting, selectable type font cartridges
Options: single and dual bin feeders, serial I/F RS232C
Retail price: $2550
Agents: Genisis Systems Ltd

SEIKOSHA BP S200 A/I

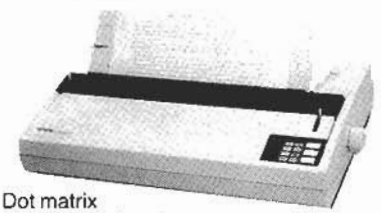
Dot matrix
Pins in print head: 8
NLQ feature: yes
Print speed in
NLQ mode: 102cps
Print speed: 200 cps
Max chars/line: 212
Paper width: 15.5 inch
Paper feed: rear and bottom
Buffer size: 18K
Ribbon type: nylon multistrike
Graphics modes: FX, IBM, bit
Interface: Centronics Par serial RS232
Features: 100 per cent duty cycle, quiet 60 dcb
Options: cut sheet feeder
Retail price: $2600
Agents: Mitsui Computer Systems

C.ITOH C315



Dot matrix
Pins in print head: 9
NLQ feature: yes
Print speed in
NLQ mode: 50cps, LQ - 30cps
Print speed: 250cps - 87 lpm
Max chars/line: 136 at 10cpi, 272 char condensed
Paper width: 4.5-16 inch
Paper feed: rear push tractor/ bottom – pull tractor/ friction sheet
Buffer size: 8K
Ribbon type: inked fabric cartridge black or 7 colour
Graphics mode: C.ITOH or IBM/ Epson graphics up to 215(V) x 240 (V) DPI
Interface: Centronic parallel or RS232-C
Features: colour models can also use standard black ribbon cartridge.
Options: single/2 bin auto sheet feeder, font cartridges
Retail price: parallel $2650.00 RS-232C $2650.00
Agent: Control Microcomputers

EPSON EX1000



Dot matrix
Pins in print head: 9
NLQ feature: yes
Print speed in
NLQ mode: 50/60 cps
Print speed: 300 cps Elite, 250 cps Pica
Max chars/line: 135
Paper width: 15 inches
Paper feed: friction/tractor. Built in back feed.
Buffer size: 8K
Ribbon type: carbon
Graphics mode: yes
Interface: standard Centronic /serial DIN
Features: colour adaptable. IBM compatible, tear off bar, auto sheet load
Options: colourkit, user installable, single and double cut sheet feeders, identity modules font modules
Retail price: $2654 (pre-GST)
Agent: Microprocessor Developments Ltd

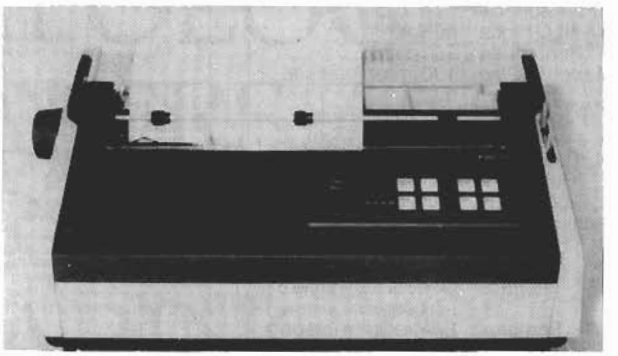
When you're ready for Quality, Move up to FACIT

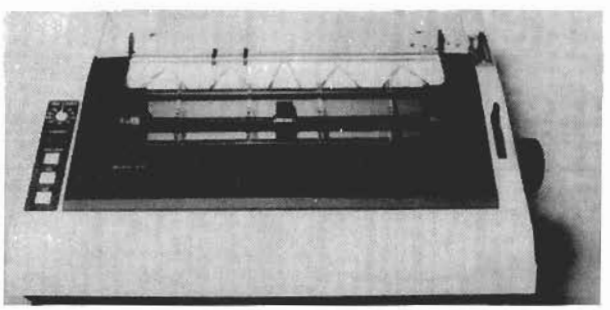
If you want the cheapest printer to do the job, read no further.
However, if you want value for money, quality and reliability, read on.
FACIT printers are engineered in Sweden with those factors in mind. We believe that you should get more than what you pay for.

NEW! FACIT D2000

24 CPS DAISY WHEEL PRINTER

- Very Quiet – less than 59dB
- Easy Menu Setup
- Diablo 630 Command Set
- Small Size – only 30 x 44cm
- Optional tractor
- Optional



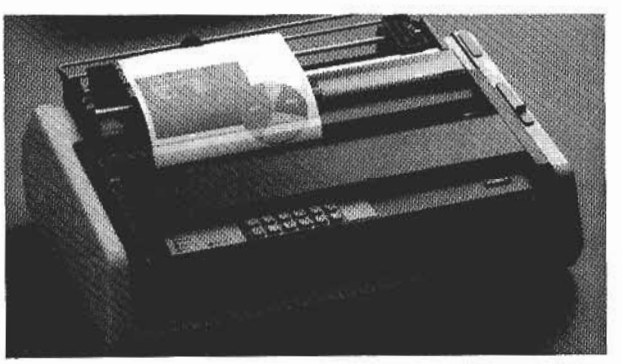


FACIT 4513/4514

- 160 cps 80 col 4513/132 col 4514
- Both Serial and Parallel interfaces standard
- Near letter quality mode
- IBM PC%Epson Emulation
- Optional single bin sheet feeder

FACIT C5500/C7500

- 250 cps C550/400 cps C7500
- 7 colours C5500/15 colours C7500
- 136 column, near letter quality mode
- Epson Emulation
- IBM Graphics Printer Emulation
- Optional single bin sheet feeder



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AUCKLAND, 459 Khyber Pass Rd.
Phone: John Robertson – (09) 545-065

WELLINGTON, 189 Willis St.
Phone: Lindsay Harris – (04) 856-658

CHRISTCHURCH, 28B Moorehouse Ave.
Phone: Bryan Lauder – (03) 795-360

northrop
INSTRUMENTS & SYSTEMS LIMITED

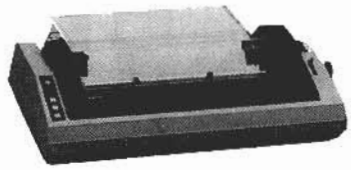
10316

PRINTERS $2000 +

NEC P5

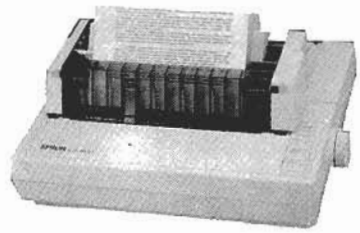
Dot matrix
Pins in print head: 24
NLQ feature: yes
Print speed in
NLQ mode: 97 cps
Print speed: 264 cps
Max chars/line: 136
Paper width: 406 mm (16 inch)
Paper feed: 3, 6, 8 lpi
Buffer size: 8K
Ribbon type: endless loop, black fabric cartridge
Graphics modes: 360 x 360 dots per inch
Interface: parallel Centronics serial RS232, Diablo
Features: 19 resident fonts – standard, additional plug in fonts available, low acoustic noise – 55 dBA,
Options: pin feed tractor, bi-directional tractor, single cut sheet feed, dual cut sht feeder
Retail price: $2718 ex tax
Agents: NEC Information Systems

FACIT 4514



Dot matrix
Pins in print head: 9
NLQ feature: yes
Print speed: 160 cps/84 lpm at 10 cpi
Max chars/line: 220 at 17 cpi
Paper width: 4" to 15"
Paper feed: removeable tractor & friction feed
Buffer size: 2K
Ribbon type: cloth cassette
Graphics mode: bit image up to 240 cpi
Interface: RS-232 serial and Centronics parallel
Features: IBM/Epson compatibility – Epson FX100 emulation
Options: sheet feeder, current loop
Retail price: $2770 plus GST
Agent: Northrop Instruments & Systems Ltd

EPSON LQ800



Dot matrix
Pins in print head: 24
NLQ feature: yes
Print speed in
NLQ mode: 60 cps
Print speed: 180 cps
Max chars/line: 80
Paper width: 10 inches
Paper feed: friction/tractor.
Buffer size: 7K
Ribbon type: carbon
Graphics mode: Epson and IBM graphics
Interface: standard Centronic serial DIN
Features: front panel font selection, IBM compatibility
Options: cut sheet feeder identity and font modules
Retail price: $2772 (pre-GST)
Agent: Microprocessor Developments Ltd

TOSHIBA P341E

Dot matrix
Pins in print head: 24
NLQ feature: yes – exceptional quality
Print speed in
NLQ mode: 72 cps
Print speed: 216 (12) 180 (10)
Max chars/line: 226 (16.7) 163 (12) 136 (8)
Paper width: 4-15 inch
Paper feed: See options
Buffer size: 4K
Ribbon type: snap-in multistrike cartridge
Graphics modes: 180 x 360
Interface: serial and centronics parallel standard
Features: 3 resident fonts; downloadable fonts on disk and plug-in font cartridges optional; Qume Sprint II emulation for W/P
Options: Autosheet feeder; uni or bi-dir. tractor feed; double or single bin MST.
Retail price: $2795
Agent: Southmark Computers Ltd

IBM 5201 QUIETWRITER 1

Resistive ribbon thermal transfer
Print speed: 40/60 cps (letter quality)
Max chars/line: 198
Paper width: 76 to 381 mm (3 to 15")
Paper feed: single sheet semi-automatic insertion (friction)
Buffer size: 1.75K
Ribbon type: non-impact (cartridge)
Interface: Centronics parallel
Features: very quiet; extended character sets for line drawing, character graphics, foreign language support & specialised applications; 2 fonts on-line simultaneously.
Options: cut-sheet & continuous forms attachments
Retail price: $2991 (excl. GST)
Agent: IBM New Zealand Ltd

NEC 3500

Spinwriter
Print speed: 35 cps
Max chars/line: 136
Paper width: 406 mm (16 inch)
Paper feed: 48 pos per inch
Buffer size: 2k
Ribbon type: multistrike, fabric continuous loop cartridge
Interface: parallel, serial, Diablo
Features: front panel controls, envelope adaptor, up to 128 char on thimble
Options: cut sheet feeder, dual bin, envelope adaptor, bidirectional tractor
Retail price: $3119 ex tax
Agents: NEC Information Systems

PRINTERS $2000 +

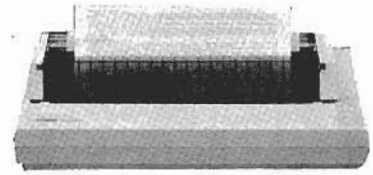
TOSHIBA 351

Dot matrix
Pins in print head: 24
NLQ feature: yes
Print speed in
NLQ mode: 100 cps
Print speed: 288 cps
Max chars/line: 226
Paper width: 15 inches
Paper feed: back
Buffer size: 4K
Ribbon type: cartridge multistrike
Graphics mode: 180 x 180, 180 x 360, IBM
Interface: Centronics parallel or RS232 serial
Features: cartridge, font for extra font selection, dip switch select for letter quality
Options: tractor feed & bin feed 1, 2 or 3
Retail price: $3200
Agent: Mitsui Computer Systems

STAR NB-15

Dot matrix
Pins in print head: 24
NLQ feature: letter quality
Print speed in
NLQ mode: 100 cps
Print speed: 300 cps
Max chars/line: 233
Paper width: 15 inch
Paper feed: push tractor and friction standard
Buffer size: 16K
Ribbon type: cartridge (refillable)
Graphics modes: 52 IBM block graphics characters 81 IBM special
Interface: parallel
Features: auto paper feed, front panel control for margin setting, change draft and LQ, forward and reverse micro feed, hex dump, print pitch, selectable type fonts, paper length setting
Options: single and dual bin cut sheet feeder, serial interface, changeable type font cartridges
Retail price: $3200
Agent: Genisis Systems Ltd

EPSON LQ1000



Dot matrix
Pins in print head: 24
NLQ feature: yes
Print speed in
NLQ mode: 60 cps
Print speed: 180 cps
Max chars/line: 132
Paper width: 15 inches
Paper feed: friction/tractor
Buffer size: 7K
Ribbon type: carbon
Graphics modes: Epson and IBM graphics
Interface: standard Centronics/ serial DIN
Features: front panel font selection, IBM compatibility
Options: cut sheet feeder identity and font modules
Retail price: $3443 (pre-GST)
Agents: Microprocessor Developments Ltd

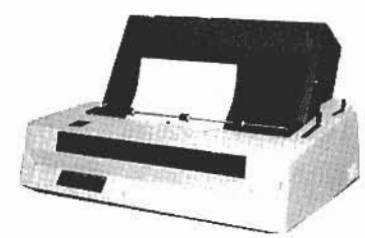
NEC P5XL

Dot matrix; colour
Pins in print head: 24
NLQ feature: yes
Print speed in
NLQ mode: 97 cps
Print speed: 264 cps
Max chars/line: 136
Paper width: 406 mm (16 inch)
Paper feed: 3, 6, 8 lpi
Buffer size: 8K
Ribbon type: black fabric, multi-strike carbon, colour cartridge
Graphics mode: 360 x 360 dots per inch
Interface: parallel, serial *RS232, Diablo*
Features: optional font cartridges, buffer expandable to 40K, 8 colour printing
Options: pin feed tractor, bi-directional tractor, single cut sheet feeder, double cut sht feeder
Retail price: $3450 ex tax
Agent: NEC Information Systems

TOSHIBA P351 (& colour)

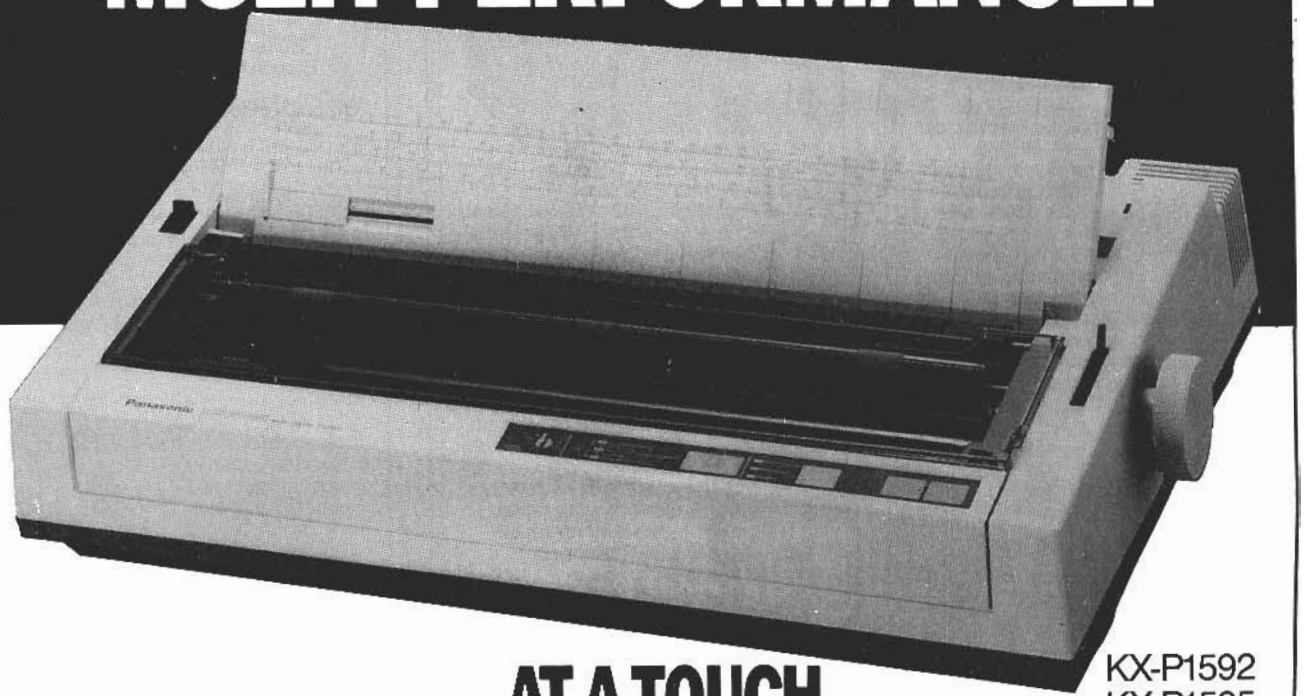
Dot matrix
Pins in print head: 24
NLQ feature: yes – exceptional quality
Print speed in
NLQ mode: 100
Print speed: 288cps (12 cpi) 240cps (10 cpi)
Max chars/line: 226 (16.7 cpi) 163 (12 cpi) 136 (10 cpi)
Paper width: 4" – 15"
Paper feed: auto paper loading and friction std.
Buffer size: 4 K
Ribbon type: snap-in cartridge 2 mill ch. life
Graphics modes: 180 x 360 dots/inch
Interface: dual parallel & serial std
Features: 3 resident fonts; downloadable fonts on disk and plug-in font cartridges optional;
Options: auto sheet feeder, bi-dir. tractor, single or dual bin CSF
Retail price: $3495 ($3750 colour)
Agent: Southmark Computers Ltd

IBM 5201 QUIETWRITER 2



resistive ribbon thermal transfer
Print speed: 50/60 cps (letter quality)
Max chars/line: 198
Paper width: 76 to 381 mm (3 to 15")
Buffer size: 15.5K
Ribbon type: non-impact (cartridge)
Graphics modes: all-points-addressable graphics 240 x 240 dpi
Interface: centronics parallel
Features: all-points-addressable monochrome graphics;
Options: cut-sheet & continuous forms feed attachments
Retail price: $3459 (excl. GST)
Agent: IBM New Zealand Ltd

MULTI-MODE. MULTI-PERFORMANCE.



...AT A TOUCH

KX-P1592
KX-P1595

Introducing the panasonic range of top quality printers.

These high performance Dot Matrix Printers with bi-directional printing and logic seeking capabilities, offer multiple mode printing . . . at a touch.

These versatile printers provide Draft, Near Letter Quality (NLQ), and proportional printing modes, as well as offering graphics capabilities for charts, graphs etc all . . . at a touch.

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All this and complete IBM compatability too!

KX-P1592 (136 COL)	180 cps in Draft mode, 38 cps in NLQ mode.
KX-P1595 (136 COL)	240 cps in Draft mode, 51 cps in NLQ mode.
KX-P1092 (80 COL)	180 cps in Draft mode, 28 cps in NLQ mode.
KX-P1091 (80 COL)	120 cps in Draft mode, 24 cps in NLQ mode.
KX-P1080 (80 COL)	100 cps in Draft mode, 20 cps in NLQ mode.
KX-P3151 (132 COL)	22 cps printing speed. Daisywheel printer

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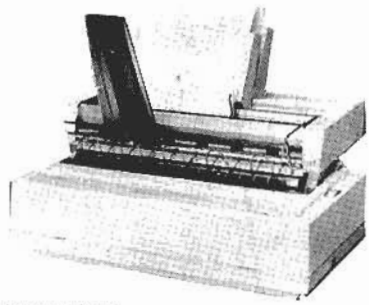
PRINTERS $2000 +

PHILIPS P2988

Ink jet dot matrix
Pins in print head: 9 ink jet channels
NLQ features: yes
Print speed in NLQ mode: 75 cps
Print speed: 200 cps
Max chars/line: 165 at 17 cpi
Point sizes: 10,12,15 & 17 cpi
Paper width: 250mm
Paper feed: friction . tractor. roll
Buffer size: up to 8Kb
Ribbon type: ink jet cartridge
Graphics modes: 144x144, 72x72, 144x120, 72x60
Interface: parallel Centronics/ Serial RS232
Features: ink jet print mechanism, 200cps < 45dB, optimized bi-directional, matrix printing, various paper feed options, graphics printing
Options: can support IBM-PC control codes
Retail price: from $3500.00
Agent: Philips New Zealand Ltd

HEWLETT PACKARD HP2603A



Daisy wheel
Print speed: 48 cps
Max chars/line: 132 at 10 cpi, 158 at 12 cpi, 198 at 15 cpi
Point sizes: 8,10,12
Paper width: up to 418 mm (16.7")
Paper feed: single sheet automatic feed – hand inserted paper
Buffer size: 1k
Interface: RS232-C (110-9600 baud)
Features: quiet, optimise path, high speed, bi-directional
Options: triple bin shift feeder accessory/contuous forms tractor accessory
Retail price: $3583
Agents: Hewlett Packard

FACIT C5500

Dot matrix colour
Pins in print head: 9
NLQ feature: yes
Print speed in NLQ mode: 60 cps
Print speed: 250 cps
Max chars/line: 136 AT 10 cpi
Paper width: 5.5" to 15.7"
Paper feed: friction, tractor, optional sheet feed
Buffer size: 2K (optional 8K)
Ribbon type: black or colour cartridge
Graphics modes: pin graphics, Epson RX-80
Interface: RS-232 Serial and Centronics parallel
Features: 7 colour printing, auto menu set up, reverse line feed
Options: sheet feeder
Retail price: $3782 plus GST
Agent: Northrop Instruments & Systems Ltd

PHILIPS P2989

Ink jet dot matrix
Pins in print head: 9 ink jet channels
NLQ feature: yes
Print speed in NLQ mode: 75 cps
Print speed: 200 cps
Max chars/line: 245 at 17 cpi
Point sizes: 10,12,15 & 17 cpi
Paper width: 400mm
Paper feed: friction, tractor
Buffer size: up to 8Kb
Ribbon type: ink jet cartridge
Graphics modes: 144x144, 72x72, 144x120, 72x60
Interface: parallel Centronics/ Serial RS232
Features: ink jet print mechanism, 200cps < 45dB, optimized bi-directional, matrix printing, various paper feed options, graphics printing
Options: can support IBM-PC control codes
Retail price: from $3750.00
Agents: Philips New Zealand Ltd

IBM 5216 WHEELPRINTER

Daisy wheel
Print speed: 25 cps
Max chars/line: 198
Paper width: 15.4" (13.2"-33.5cm)
Paper feed: standard: manual single sheets (friction) automatic integrated cut-sheet feed continuous forms feed
Buffer size: 1.5K
Ribbon type: multi-strike or single-strike option
Interface: parallel (standard)
Features: built-in paper handling; print quality; engraved characters; acoustic engineered design; impression control for high-quality printing on different paper types
Options: range of printwheels
Retail price: $3849 (excl GST)
Agents: IBM New Zealand Ltd

DIGITAL LN03

Laser
Retail price: $7724
Agents: Digital Equipment (NZ) Ltd

DIGITAL LA210

Dot matrix
Retail price: $3525
Agent: Digital Equipment (NZ) Ltd

DIGITAL LA75

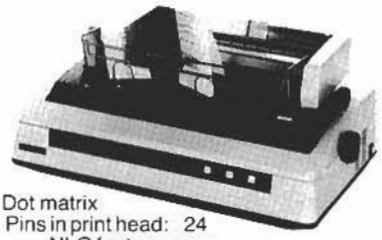
Dot matrix
Retail price: $1600
Agents: Digital Equipment (NZ) Ltd

SUPER 5 1201

Dot matrix
Retail price: $995
Agents: Hitec Micro Ltd. See add on back cover of this issue.

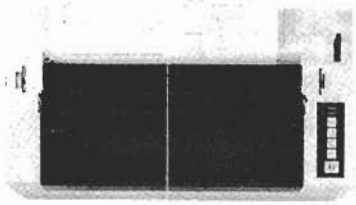
PRINTERS $2000 +

C.ITOH 1570C



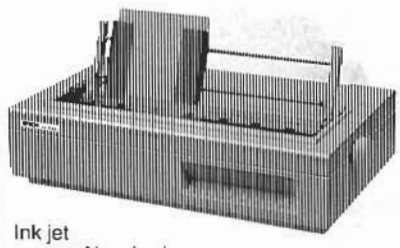
Dot matrix
Pins in print head: 24
NLQ feature: yes
Print speed in
NLQ mode: 133 cps LQ-66 cps
Print speed: 250 cps/66 lpm
Max chars/line: 136 at 10 cpi
233 compressed
Paper width: 4.5" to 15.5"
Paper feed: rear push tractor/pull tractor/friction sheet feed
Buffer size: 16K
Ribbon type: inked fabric cartridge black or 7 colour
Graphics modes: C.ITOH or IBM/ Epson graphics up to 360DPI
Interface: Centronics parallel or RS-232-C
Features: can use either black or colour ribbon cartridge for 7 colours
Options: auto sheet feeder, font cartridges
Retail price: parallel $3895.00 RS-232-C $3995.00
Agent: Control Micro-computers

NDK 5025



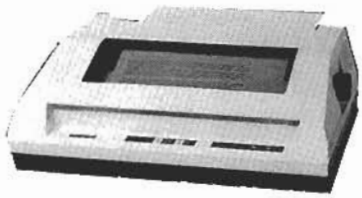
Dot matrix
Pins in print head: 24
NLQ feature: letter quality
Print speed in
NLQ mode: 90 cps (12 cpi)
Print speed: 180 cps (draft 12 cpi)
Max chars/line: 136 col at 10 cpi, 163 at 12 cpi, 256 compressed
Paper width: 4" to 16.5"
Paper feed: Adjustable pull tractor & friction feed
Buffer size: 400 char
Ribbon type: mylar black or red/ black 13mm x 17mm endless mobius loop
Interface: Serial RS-232 or Centronics parallel
Features: very high speed skip & wing feed functions
Options: Down load font memory board, auto sheet feeder, 16K receiving buffer
Retail price: $3,995.00 plus GST
Agent: The Microcomputer Electronic Co. Ltd

EPSON SQ-2000



Ink jet
Nozzles in print head: 24
NLQ feature: yes
Print speed in
NLQ mode: 105 cps (letter quality)
Print speed: 176 cps
Max chars/line: 272 (20 chars inch)
Paper width: cut sheet: 182-364 mm Fanfold: 139-406 mm
Paper feed: friction feed
Buffer size: 2K
Graphics modes: international character set
Interface: optional – parallel, RS2320 serial, IEEE -488
Features: bi-directional printing proportional spacing quiet operation
Options: tractor unit, multi-font option, single/ double bin csf
Retail price: $4065
Agents: MDL New Zealand

SEIKOSHA BP 5420 AI

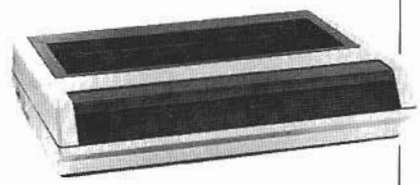


Dot matrix
Pins in print head: 8
NLQ feature: yes
Print speed in
NLQ mode: 104 cps
Print speed: 420 cps
Max chars/line: 212
Paper width: 15.5 inches
Paper feed: rear and bottom
Buffer size: 18K
Ribbon type: nylon multistrike
Graphics mode: FX IBM bit
Interface: Centronics serial RS232
Features: 100 pc duty cycle, 60 db, front dial for font paper length selection
Options: cut sheet feeder and IBM sys 34, 36
Retail price: $4390
Agent: Mitsui Computer Systems

NEC 8800

Spinwriter
Print speed: 55 cps
Max chars/line: 136
Paper width: 406 mm (16 inch)
Paper feed: 48 pos per inch
Ribbon type: endless loop multi-strike or fabric
Interface: parallel or serial – plug-in modules
Features: Upto 128 char on thimble, envelope adaptor, flip cartridge ribbon
Options: uni and bidirectional tractors, cut sheet feeder, dual bin adapter, envelope
Retail price: $4712 ex tax
Agent: NEC Information Systems

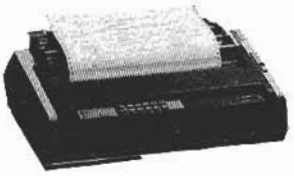
C.ITOH CI3500



Dot matrix
Pins in print head: 9
NLQ feature: yes
Print speed in
NLQ mode: 87 cps
Print speed: 350cps/135lpm
Max chars/line: 136 at 10cpi, 233 compressed
Paper width: 3-16 inches
Paper feed: bidirectional tractor or friction 12ips slew
Buffer size: 2K
Ribbon type: inked fabric
Graphics mode: up to 240dpi(H) X 144 dpi (V)
Interface: Centronic parallel or RS232-C
Features: high throughput for heavy duty mini-computer, multi-user microcomputer applications.
Options: auto sheet feeder, interface cartridges
Retail price: $4990.00
Agent: Control Micro-computers

PRINTERS $2000 +

FACIT C7500



Dot matrix colour
Pins in print head: 18
NLQ feature: yes
Print speed in
NLQ mode: 100 cps
Print speed: 400 cps
Max chars/line: 136 at 10 cpi
Paper width: 5.5" to 15.7"
Paper feed: friction, tractor, optional sheet feed
Buffer size: 4K
Ribbon type: black or colour cartridge
Graphics mode: pin graphics, Epson RX-80
Interface: RS-232 serial and Centronics parallel
Features: 15-colour printing, auto menu set-up, reverse line feed
Options: sheet feeder
Retail price: $5462 plus GST
Agent: Northrop Instruments & Systems Ltd

IMPACT L400-I

Laser
Print speed: 4 pages/minute
Max chars/line: 80,132,136,233
Point sizes: 8 & 10 and double height
Paper width: A4, B5, letter, foolscap
Paper feed: single cassette tray plus manual feed for transparencies, envelopes business cards etc. optional triple bin feed
Graphics modes: 300 x 300 dpi
Interface: serial and parallel
Features: dual 68000 processors (10 MHz), 384K RAM, 16 char alphanumeric front panel display. 6 internal fonts. all fonts attributable by bolding, italicising, double height, double width, rotating, shading, profile and landscape mode line and box drawing forms overlay, logos, signatures, font cartridges system.
Options: upgrade to L800, triple bin sheet feeder
Retail price: $5775 (incl. GST)
Agent: Calibre Group

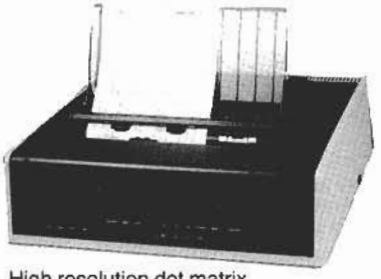
DIABLO D80IF

Daisy wheel
Print speed: 80 cps
Max chars/line: 264 (20 cpi)
Paper width: 15.2 inch
Paper feed: 2 bin
Buffer size: 1.5K
Ribbon type: multistrike
Graphics modes: IBM
Interface: API all purpose interface
Features: integrated 2 bin sheet feeder many typestyle 200 character set daisy wheel
Options: envelope feeder; tractor feed
Retail price: $6380
Agents: Mitsui Computer Systems

PHILIPS GP300-PX1

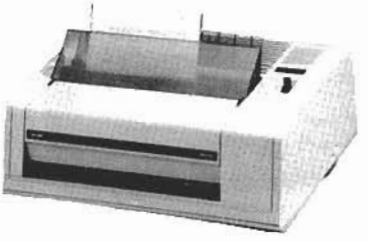
High resolution dot matrix
Pins in print head: 18
NLQ features: yes
Print speed in
NLQ mode: 80 cps at 18x25 single pass
Print speed: 300 cps
Max chars/line: 180 at 15 cpi
Point sizes: 10,12,15 cpi plus proportion
Paper width: 340mm
Paper feed: platen, tractor, front
Buffer size: 3Kb
Ribbon type: multistrike
Graphics modes: bit image, IBM-PC compatible
Interface: parallel Centronics/ Serial RS232
Features: High-res 18-wire head, several type styles.
Options: front feed and up to 3 single sheet bins,
Retail price: from $6500.00
Agent: Philips New Zealand

PHILIPS GP300



High resolution dot matrix
Pins in print head: 18
NLQ features: yes
Print speed in
NLQ mode: 80 cps at 18x25 single pass
Print speed: 300 cps
Max chars/line: 180 at 15 cpi
Point sizes: 10,12,15 cpi plus proportion
Paper width: 340mm
Paper feed: platen, tractor, front
Buffer size: 3Kb
Ribbon type: multistrike
Graphics modes: 144x144, 72x72, 144x120, 72x60 dpi
Interface: Serial RS232
Features: High-res 18-wire head,
Options: 6 add. fonts, front feed and up to 3 single sheet bins,
Retail price: from $6500.00
Agent: Philips New Zealand Ltd

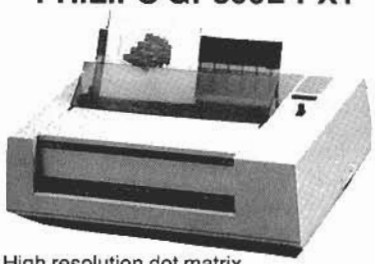
PHILIPS GP480



High resolution dot matrix
Pins in print head: 18
NLQ features: yes
Print speed in
NLQ mode: 100 cps at 18x25 single pass
Print speed: 480 cps
Max chars/line: 216 char/line at 18 cpi
Point sizes: 10,12,14.4,15,18 cpi plus proportion
Paper width: 340mm
Paper feed: platen, tractor, front
Buffer size: 3Kb
Ribbon type: multistrike
Graphics modes: 144x144, 72x72, 72x60 dpi
Interface: Serial RS232
Features: High-res 18-wire head,
Options: 6 add. fonts, front feed and up to 3 single sheet bins,
Retail price: from $7000.00
Agent: Philips New Zealand

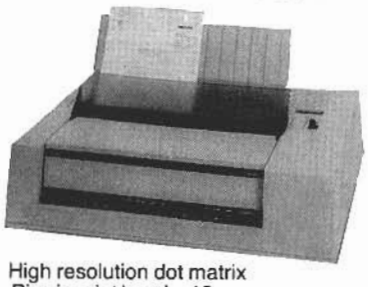
PRINTERS $2000 +

PHILIPS GP300L-PX1



High resolution dot matrix
Pins in print head: 18
NLQ feature: yes 18x25 & 18x50 single pass, 36x50 double pass
Print speed in NLQ mode: 80 cps at 18 x 25 single pass
Print speed: 300 cps
Max chars/line: 216 at 15 cpi
Point sizes: 10,12,15 cpi plus proportional
Paper width: 400mm
Paper feed: platen, tractor, front
Buffer size: 3K
Ribbon type: multistrike
Graphics modes: bit image, IBM-PC compatible
Interface: parallel Centronics/ serial RS232
Features: high-res 18-wire head,
Options: front feed and up to 3 single sheet bins, current loop interface
Retail price: from $7000.00
Agents: Philips New Zealand

PHILIPS GP300L



High resolution dot matrix
Pins in print head: 18
NLQ feature: yes 18x25 & 18x50 single pass, 36x50 double pass
Print speed in NLQ mode: 80 cps at 18 x 25 single pass
Print speed: 300 cps
Max chars/line: 216 at 15 cpi
Point sizes: 10,12,15 cpi plus proportional
Paper width: 400mm
Paper feed: platen, tractor, front
Buffer size: 3K
Ribbon type: multistrike
Graphics modes: 144x144, 72x72, 72x60 dpi
Interface: Serial RS232
Features: high-res 18-wire head, Data & Gothic
Options: 6 add. fonts, front feed and up to 3 single sheet bins,
Retail price: from $7000.00
Agents: Philips New Zealand

FACIT OPUS 2 P7000

Laser
Print speed: 8 pages per minute
Paper width: A4: 210 x 297 mm or Letter: 216 x 279 mm
Paper feed: paper tray
Buffer size: 256 K (512 K optional)
Graphics modes: raster, line & box
Interface: RS-232 Serial and Centronics parallel
Features: 4 standard fonts, Diablo 630 emulation
Options: font cartridges
Retail price: $7471 plus GST
Agent: Northrop Instruments & Systems Ltd

PHILIPS GP480L

High resolution dot matrix
Pins in print head: 18
NLQ feature: yes 18x25 & 18x50 single pass, 36x50 double pass
Print speed in NLQ mode: 100 cps at 18 x 25 single pass
Print speed: 480 cps
Max chars/line: 260 at 18 cpi
Point sizes: 10,12,14.4,15,18 cpi plus proportional
Paper width: 400mm
Paper feed: platen, tractor, front
Buffer size: 3K
Ribbon type: multistrike
Graphics modes: 144x144, 72x72, 72x60 dpi
Interface: Serial RS232
Features: high-res 18-wire head
Options: 6 add. fonts,
Retail price: from $7500.00
Agents: Philips New Zealand Ltd

HEWLETT PACKARD LASER JET

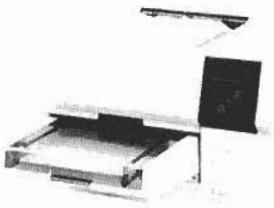
Laser
Print speed: 8 pages/minute
Max chars/line: Portrait: A4 77 chars/line at 10cpi/93 chars/line at 12 cpi. Landscape: A4 112 chars/line at 10 cpi
Point sizes: up to 18
Paper width: 8.5" x 11" or 8.5" x 14", A4 210mm x 297mm or B5 182mm x 257mm
Paper feed: single sheet automatic. Two sided printing capability with manual feed for second pass
Buffer size: 59k
Graphics modes: Raster graphics capability
Interface: standard RS-232-C (300-19.2k baud)
Features: print resolution up to 300 x 300 dots/inch, up to 8 fonts/page, compact desk top size, very quiet operation (<55dBA)
Options: variety of cartridges with up to 7 fonts/ cartridge/variety of paper tray sizes available
Retail price: $8243
Agents: Hewlett Packard

CANON LBP-8 A1/A2

Laser beam printer
Print head: 90,000 dots/square inch
Print speed: 8 pages/minute
Paper width: A4/foolscap
Paper feed: cassette sheet feed
Buffer size: memory sizes – A1 128K, A2 1.1 MEG
Ribbon type: disposable cartridge 3000 plus copies
Graphics modes: A1 has dot addressable graphics, A2 has image/vector graphic printing
Interface: parallel or serial
Features: 300 dots per inch. Vertical/horizontal print,
Options: triple bin sheet feeder (includes envelopes)
Retail price: $8,382 incl. GST
Agents: Canon Data Products

PRINTERS $2000 +

RICOH LP4080R



Laser (semiconductor)

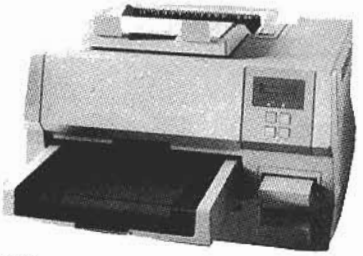
Print speed:	8 pages per min
Paper width:	A4 cut sheets
Paper feed:	automatic
Graphics modes:	prints graphs/ diagrams
Interface:	RS232 and Centronics interfaces; Diablo 630 emulation
Features:	300 x 300 dpi resolution – 4 std fonts (portrait or landscape orientations) – 250 sheet paper input – face down collation – design lifespan of 600,000 pages
Options:	Epson FX-80/FX-100 and hp laserjet emulations, font cartridges, downloadable fonts
Retail price:	on application
Agent:	Datacom Equipment Ltd

IMPACT L800-II

Laser

Print speed:	8 pages/minute
Max chars/line:	80,132,136,233
Point sizes:	8 to 12 & double height standard – up to 24 pt optional
Paper width:	A4, B5, letter, foolscap
Paper feed:	single cassette tray plus manual feed for transparencies, envelopes business cards etc. optional triple bin feed
Graphics modes:	300 x 300 dpi
Interface:	serial and parallel
Features:	dual 68000 processors (10 MHz), 384K RAM, 16 char alphanumeric front panel display. 6 internal fonts. all fonts attributable by bolding, italicising, double height, double width, rotating, shading,
Options:	Triple bin sheet & envelope feeder, extra memory, large range of fonts
Retail price:	$8470 (incl. GST)
Agent:	Calibre Group

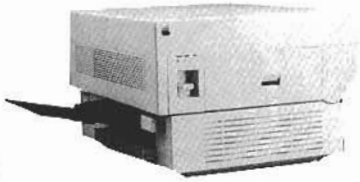
FACIT OPUS 2E P7080



Laser

Print speed:	8 pages per minute
Paper width:	A4: 210 x 297mm or letter: 216 x 279mm
Paper feed:	paper tray
Buffer size:	512K (optional 2MB)
Graphics mode:	raster, line, box, HP and IBM emulation
Interface:	RS-232 serial and Centronics parallel
Features:	same as Opus 2 but with HP Laser jet and IBM Proprinter emulations, six standard fonts, 32 character LCD status display
Options:	font cartridges
Retail price:	$8732 plus GST
Agent:	Northrop Instruments & Systems Ltd

APPLE LASERWRITER AND APPLE LASERWRITER PLUS



Laser

Print speed:	8 pages/minute
Max chars/line:	dependent on font size
Point sizes:	4-720
Paper width:	8"
Paper feed:	automatic and manual
Graphics modes:	all text and graphics printed at 300 by 300 dpi
Interface:	Appletalk RS232C
Features:	both printers work with most Macintosh applications and IBM PC or compatibles with postscript. Compatible software full page high resolution graphics large selection of fonts
Retail price:	$9695 excl. GST
Agents:	CED Disitributors Ltd

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PRINTERS $2000 +

HEWLETT PACKARD LASER JET PLUS

Laser

Print speed:	8 pages/minute
Max chars/line:	Portrait: A4 77 chars/line at 10 cpi/93 chars/line at 12 cpi. Landscape: A4 112 chars/line at 10 cpi
Point sizes:	up to 30 pt
Paper width:	8.5" x 11" or 8.5" x 14" A4 210mm x 297 mm, or B5 182mm x 257mm
Paper feed:	single sheet automatic.
Buffer size:	395K
Graphics modes:	Raster graphics capability
Interface:	standard parallel and RS 232C/422 interface (300-19.2K baud)
Features:	same as laser Jet
Options:	variety of paper tray sizes available
Retail price:	$10,889
Agent:	Hewlett Packard

HEWLETT PACKARD LASER JET 500 PLUS

Laser

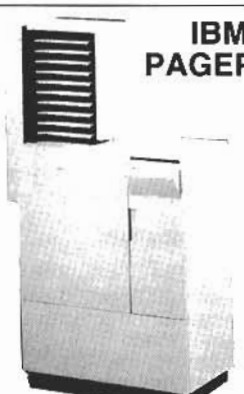
Print speed:	8 pages/minute
Max chars/line:	Portrait: A4 77 chars/line at 10 cpi/93 chars/line at 12 cpi.
Point sizes:	up to 30 pt
Paper width:	8.5" x 11" or 8.5" x 14" A4 210mm x 297 mm, or B5 182mm x 257mm
Paper feed:	dual bin paper feed with automatic feed
Buffer size:	395K
Graphics modes:	Raster graphics capability
Interface:	standard parallel and RS 232C/422 interface (300-19.2K baud)
Retail price:	$13,535
Agent:	Hewlett Packard

C.ITOH CI-600Q

Line printer 600 LPM

Pins in print head:	Shuttle Matrix
NLQ feature:	yes
Print speed in NLQ mode:	170 LPM
Print speed:	600 LPM
Max chars/line:	256
Paper width:	3.5" to 6"
Paper feed:	bottom loading tractor feed
Buffer size:	452 bytes
Ribbon type:	nylon 50m spool
Graphics modes:	bit image
Interface:	7 bit centronics parallel (Data-products 8 bit parallel (option)) & RS-232 serial standard
Features:	variable print speed,
Options:	serial interface board 7.5KB buffer, bar code pattern generator
Retail price:	$18,000 plus GST
Agent:	The Microcomputer Electronic Co. Ltd.

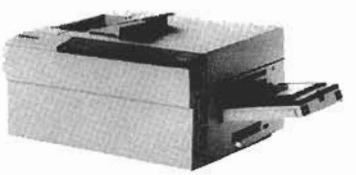
IBM 3812 PAGEPRINTER



LED imaging xerographic printing

Print speed:	up to 12 pages per minute
Max chars/line:	190 on full scap (landscape)
Point sizes:	8-24
Paper width:	7-8.5" (178-216mm)
Paper feed:	double-bin cassette (standard)
Buffer size:	1 page
Graphics modes:	full page apa graphics 240 x 240 dpi
Interface:	serial-RS232
Features:	standard with 62 fonts;
Options:	sharing card, font management system, PC-DOS printer driver
Retail price:	$18157 (excl. GST)
Agent:	IBM New Zealand

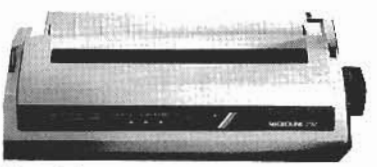
C.ITOH LIPS-10



Laser page printer

Print speed:	10 pages/minute 30 sec warmup
Point sizes:	2-50 points typesetting fonts
Paper width:	A4, letter/quarto, legal
Paper feed:	page feed, 250 sheets cassette, 250 sheets out tray
Buffer size:	512 RAM
Ribbon type:	single component toner system
Graphics modes:	300 x 300 DPI
Interface:	Centronics parallel and RS-232-C
Features:	face down collated output. Four typesetting fonts. Designed for 15,000 pages/month 600,000 pages life.
Options:	font cartridges
Retail price:	POA
Agent:	Control Microcomputers

ML293 OKI MICROLINE

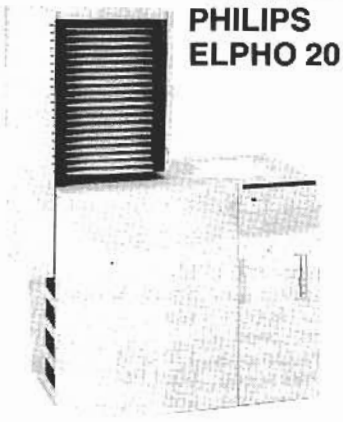


Dot matrix

Pins in print head:	18
NLQ feature:	17 x 17
Print speed in NLQ mode:	100 cps
Print speed:	200 cps
Max chars/line:	233
Point sizes:	5,6,8.5,10,12,17.1
Paper width:	15 inch
Paper feed:	rear or bottom
Buffer size:	15K standard, 32K optional
Ribbon type:	black or colour, fabric cartridge
Graphics modes:	block or APA (single, double or quad density)
Interface:	personality modules for either OKI or IBM (Epson), serial or parallel
Features:	On-line menu select options,
Options:	10 or 15 inch cut sheet feeder.
Agent:	AWA (NZ) Ltd

PRINTERS $2000 +

PHILIPS ELPHO 20



Electrophotographic (similar to laser)

Print speed:	20 pages/minute
Max chars/line:	125 at 15 cpi
Point sizes:	10, 12 & 15 cpi
Paper width:	216mm
Paper feed:	cut sheet,
Buffer size:	2 pages
Graphics modes:	300x300 dpi
Interface:	parallel , serial RS232
Features:	quiet non-impact, stackers, multiple fonts
Options:	up to 4 cassettes, sorter with 10 or 20 stations
Retail price:	from $35,000.00
Agent:	Philips New Zealand Ltd

M1294 OKI MICROLINE

Dot matrix

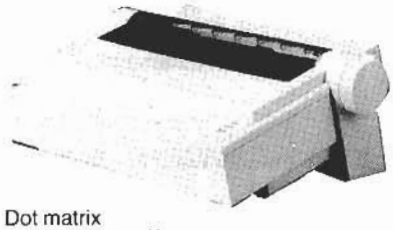
Pins in print head:	18
NLQ feature:	17 x 17
Print speed in	
NLQ mode:	100 cps
Print speed:	400 cps
Max chars/line:	233
Point sizes:	5,6,8.8,10,12,17.1
Paper width:	15"
Paper feed:	rear cr bottom
Buffer size:	15K standard, 32K optional
Ribbon type:	black or colour fabric cartridges
Graphics mode:	block or APA (single, double or quad density)
Interface:	personality modules IBM (Epson) or OKI in parallel or serial
Features:	on line menu select options, colour printing both text and APA graphics, With IBM personality, colour screen dump provided, OKI version, replacement printer for the OKI 2410 and 2350 printers, IBM (Epson) emulates IBM graphics printer
Options:	10 or 15 Inch Cut Sheet Feeder.
Agent:	AWA (NZ) Ltd

EPSON LQ-2500

Dot matrix

Pins in print head:	24
NLQ feature:	yes
Print speed in	
NLQ mode:	90
Print speed:	270
Max chars/line:	272 (20 chars/ in)
Paper width:	cut sheet: 182-364 mm Fanfold: 101-406 mm
Paper feed:	bi-directional push tractor
Buffer size:	8K
Ribbon type:	multi-strike
Graphics modes:	IBM & international character sets
Interface:	STD: Centronics parallel & RS-232C serial
Features:	macro lcd control panel, automatic cut sheet loading, emulation & font cartridge capability
Options:	colour printing, single/double bin csf
Agent:	MDL New Zealand

APPLE IMAGEWRITER II



Dot matrix

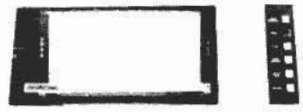
Print speed in	
NLQ mode:	45 cps
Print speed:	250 cps
Max chars/line:	36-136
Point sizes:	up to 16 x 8
Paper width:	3 to 10 inches
Buffer size:	2 Kb
Ribbon type:	fabric, continuous loop
Graphics modes:	72,80,96,107,120, 136,144 and 160 dpi
Interface:	RS232
Features:	choice of speeds print qualities, push button paper loading prints text-graphics in colours using appropriate software and ribbon
Options:	sheet feeder, 32k memory opt, Apple-Talk, black or colour ribbon
Agent:	CED Distributors Ltd

PRINTRONIX MVP-150/ 150B

Line matrix

Print speed:	80-200 lpm
Max chars/line:	200 in condensed mode
Paper width:	16"
Paper feed:	adjustable tractors with 5 pin engagement; bottom paper feed
Ribbon type:	reel to reel
Graphics modes:	prints graphs/ diagrams
Interface:	150: parallel – Centronics or Data-products: serial – RS232C. 150B: IBM PC/PC-XT and Epson MX code compatible
Features:	character sets select able; full duty cycle; multi-mode printing
Options:	enhanced graphics board for barcoding etc.
Retail price:	on application
Agents:	Datacom Equipment

PRINTRONIX P300/P600

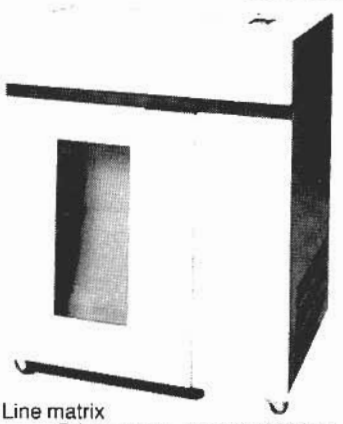


Line matrix

Print speed:	300 lpm/600 lpm
Max chars/line:	220 in compressed mode
Paper width:	16"
Ribbon type:	reel to reel
Graphics modes:	prints graphs/ diagrams
Interface:	ASCII parallel full line buffered; Centronics plug compatible
Features:	character sets selectable: full duty cycle
Options:	multi-mode printing-enhanced graphics board. Interfaces available for most host computers
Retail price:	on application
Agent:	Datacom Equipment Ltd

PRINTERS $2000 +

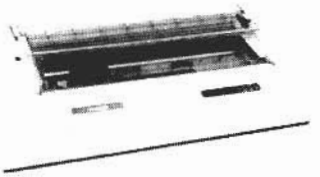
PRINTRONIX P300XQ/ 600XQ



Line matrix

Print speed:	300 lpm/600 lpm
Max chars/line:	132
Paper width:	16"
Paper feed:	adjustable tractors with 8 pin
Ribbon type:	reel to reel
Graphics modes:	prints graphs/ diagrams
Interface:	ASCII parallel full line buffered;
Features:	character sets select able; full duty cycle; noise level 55 DBA
Options:	printing; enhanced graphics board
Retail price:	on application
Agents:	Datacom Equipment

PRINTRONIX S7024



Serial dot matrix

NLQ feature:	yes
Print speed:	240 cps
Max chars/line:	136
Paper width:	15.6"
Paper feed:	tractor feed, friction feed
Buffer size:	6K
Graphics modes:	prints graphs/ diagrams
Interface:	parallel – Centronics compatible
Features:	character sets selectable: full duty cycle; multi-mode printing
Options:	IBM 3270 and sys 34/ 36/38 integral interfaces; serial RS232C interface 12K buffer; single or dual bin cut sheet feeders
Retail price:	on application
Agent:	Datacom Equipment

PRINTRONIX DATAPRINTER 1200

High speed band

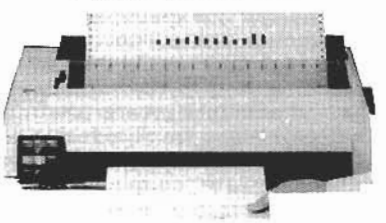
Print speed:	1200 lpm
Max chars/line:	136 column
Paper width:	16"
Paper feed:	adjustable tractors with 6 pin engagement
Ribbon type:	reel to reel
Interface:	dataproducts compatible
Features:	acoustic floor cabinet, long life ribbon and stainless steel print band, high MTBF
Options:	Centronics cdc and RS232C interfaces; various character sets
Retail price:	on application
Agents:	Datacom Equipment Ltd

QMS LASERGRAFIX 1200

Laser

Print speed:	12 pages per min
Point sizes:	300 x 300 dpi
Paper feed:	1 and 2 bin feeders
Graphics modes:	prints graphs and diagrams
Interface:	RS232; Dataproducts; Centronics parallel interfaces
Features:	firmware includes business graphics, vector graphics, forms generation; character sets selectable; noise level <55 dba; full duty cycle
Options:	Tektronix, Calcomp and Versatec emulations. IBM 3270, 3276, sys 34 8100 interfaces
Retail price:	on application
Agents:	Datacom Equipment Ltd

IBM 4202 PROPRINTER XL



Dot matrix

Pins in print head:	9
NLQ feature:	yes
Print speed in NLQ mode:	40 cps
Print speed:	200 cps
Max chars/line:	232
Paper width:	16"
Paper feed:	front power-assist single sheet & envelope, power-assist continuous forms
Buffer size:	4K (8K optional)
Ribbon type:	nylon fabric
Interface:	parallel (serial optional)
Features:	front sheet feed/envelope feed;
Options:	asynchronous serial interface, buffer expansion
Retail price:	to be announced
Agents:	IBM New Zealand Ltd

Hardware Survey

Bits & Bytes' annual hardware survey begins in December with a look at personal computers in the Under $5,000 bracket.

Over three issues we will present a roundup buyers have come to recognise as a reliable and useful reference.

December/January 1986

.... Part 1: Computers Under $5000

February 1987.....

.... Part 2: Computers $5000 to $12,000

March 1987.....

....Part 3: Computers over

More uses for the home computer

Dear Sir,

I have been reading articles in your magazine now for twelve months and my chief complaint is that there do not appear to be enough articles on applying computers to home uses. When I bought my Atari 130XE computer people would say to me, "What can you use it for?"

At the time I was off work recovering from a hernia operation and I had decided that as I could not do any physical work I would learn to use a computer. I was operating a microprocessor controlled packing plant at work and I thought that I could better myself by learning to operate a home computer. I soon discovered that there was quite a bit of difference in the two, so to save myself the embarrassment of having spent all this money on a machine that most people I was associated with thought should be used for playing games, I purchased books on computer applications. Many of these were a waste of money but I did find some that I have been able to modify for my own usage.

One of the best was the SynCalc spreadsheet program, and by using a template for calculating mortgage repayments I was able to try various alternatives using this template. I have since refinanced my mortgage and without increasing my repayments I will repay my mortgage four years earlier for a saving of $16800. Although this certainly pays for my computer a number of times over, my savings do not stop there as I have bought a home accountant program.

By using this I have created myself a budget and by monitoring this with my computer I will increase my svings by $4000 at least. I will admit that I could have probably achieved this if I had used a budget before, but this system makes it much more simple and interesting. Making a monotonous task interesting is one of the big advantages of using a computer.

My next use for my computer was using it to monitor my stock market investments. This is something I have just started recently as the templates I have found published in various magazines and books make no allowances for stamp duty, brokerage, rights issues and bonus issues. Many do not calculate percentage gains or losses, let alone what the return would be if sold net of brokerage. After a great deal of trial and error I have created a template that enables me to do these things. The problem in building this module was that of using the IF...THEN...ELSE statement to calculate brokerage.

Brokers have a flat rate of $25 for purchases up to $1000. If the purchase is greater then they charge 2½ per cent up to $5000, then 1½ per cent for amounts greater than $5000. Whenver I tried to write the formula into the appropriate cell it would charge $25 whether a purchase had been made or not. I discovered that to make it work I had to use the following formula:

@IF cell 1>and<1000 then 25 else cell *.2½.

This means there has to be an amount in the cell it is searching before it will function and will not install $25 without reason. It would require a slight modification to the formula to be used on amounts greater than $5000, but as I am a small investor this one suits me.

With this template, coupled with my recent purchase of the SynApse program SynStock, I hope to make my share portfolio more profitable. SynStock is a stock charting program with capabilities of down loading stock quotes from the Compuserv database in the USA. Whether it can do the same with databases here in New Zealand I would like to know. It graphs highest lowest and close on one graph, with volume on a separate one at the bottom. This helps one to guess how the market will perform in the future by studying how the market has operated in the past. Although I have written that it is a guess, I think it enables a guess to be made on the basis of experience.

Lastly, I have written this letter using an Atari Word Processor and until I obtained this computer I had never attempted to type, so it is another skill my computer is teaching me. Although I am not fast I am certainly doing better than those who thought this extravagance was money wasted, and I hope that in the future that my computer will enable me to better myself in my job.

Yours faithfully,
R.K. Larsen,
Otorohanga

P.S. Could any reader help me obtain a driver for my Star Genisis printer which is compatible with my Atari 130XE? No computer store seems to be able to help.

*(Editor's Note: It's difficult after four years of **Bits & Bytes** to keep going over old ground, but we're always more than happy to have readers' suggestions and comments. Some Q + A topics are becoming rather technical, but there's always a place for the beginner. Other comments would be welcomed.)*

F-15 Strike Eagle

An Atari computer game review by Michael Fennessy

When I first looked at this game in my local software stockist, I was amazed to find a 36-page manual, but I later found it was necessary as it took me three hours to figure out how to work all the aircraft weapons and navigation systems.

In F-15 Strike Eagle, designed by real F-15 pilots, you fly with the screen showing a gunsight, below which is the radar, weapons status, and a map which is used for electronic navigation. When the game starts you are already airborne, and begin by plotting a course, with a choice between an aggressive mission, bombing surface-to-air missile (SAM) sites and airfields along with the main target, or just bombing the main target and returning to base with the minimum of risk. Once the course is decided, navigation is a matter of keeping an ever-changing letter in the gunsight.

Insturctions for all but the last mission are contained in the manual, giving details on the dangers to be faced during the mission, along with a flight plan. The manual also contains information on such things as basic aerodynamics, bombing methods, and the types of aircraft and SAMs you will encounter on your F-15 missions.

Although complicated, F-15 Strike Eagle provides a real challenge. It is a game in which you can experience the thrills of supersonic flight, and once you have mastered the aircraft systems you should find it very exciting. Certainly it is one of the best games I have seen for the Atari. Produced by Datasoft, it is available on disk.

Review copy supplied by J.E. Cagney & Sons Ltd, Mosgiel.

Word processing for all ages

by Paul Left

A common misconception among teachers is that educational software should include features found in 'professional' programs. While it is true that children can benefit from using advanced features, and that they deserve excellent software as much as adults do, their needs are special and often quite different from those of adult users.

For example, database software for the classroom should ideally be able to handle large chunks of free-form text and have few restrictions on length of field-names or on field or record length. Flexibility and ease of use are more important here than advanced sorting, programming, or relational features. In other words, teachers need to look for software which enhances learning and which meets children's needs, rather than powerful, professional software which may be cumbersome and difficult to use.

this program allows young children to achieve early word processing success

Educational and business programs need to be evaluated on completely different criteria. Software which tries to meet the needs of children as well as those of experienced users runs the risk of being an unsatisfactory compromise for all.

The creators of Magic Slate have attempted to resolve this problem by providing three variations of the program. An 80-column version is provided which the publishers, Sunburst Communications, call the 'professional' model. For educational purposes, two other configurations are available: a 20-column version for younger children or the visually impaired, and a 40-column version for older children. All three are supplied as one package, including two copies of the 20/40-column disk and two copies of the 80-column disk. The disks are copy-protected in ProDOS format.

Sunburst's approach is a success. The 40-column version in particular is an excellent writing/publishing tool for children, unencumbered by the advanced features of the 80-column version. As the latter will probably be little used in schools, this article will look mainly at the 20/40-column programs, both of which use the Apple II's high-res screen for the display.

The 20-column configuration has large, easy-to-read characters, ideally suited for children in junior classes. The opening display is an icon-based menu with eight options. The child can press just return to start editing, or highlight another option either by using the arrow keys or by typing the first letter of the option. If there is no file in memory when EDIT is chosen, the child is prompted for the name of the new file.

Once editing begins, a header shows the page, line, and column numbers, as well as the file-name and a ruler showing preset tab-stops. A footer shows the current mode (eg TYPEOVER, INSERT, CURSOR MOVE) and the commands to get help or go to the main menu. Help screens are very brief but sufficient to explain the major commands, although a few features are not documented in the help screens.

Because the 20- and 40-column versions of Magic Slate use the high-res display, type-style and formatting options are able to be shown on the screen during editing. The only extra type-face available in 20-column mode is underlining, the Control-O command switching between underlined and normal text.

Figure One shows the type styles availabe in the 40- and 80-column versions. They are only displayed as such in the former, as the 80-column version uses the normal text screen and shows the current settings as a three-character code at the bottom of the screen. The ability to see text as it will appear is an attractive feature of the 20- and 40-column versions which sets Magic Slate above most other word processors used in schools. The outline text style is also a real bonus and adds impact to children's published work.

Other commands are also given using Control characters, and on the whole these are sensibly mnemonic. I was impressed with the way the delete command is used. All delete commands start with Control-D, which highlights the character under the cursor. Control-W then highlights the next word, Control-S the next sentence, Control-P the next paragraph. Pressing Return then deletes the highlighted text. While this is not as fast as single-character delete commands, it is much easier to remember for beginning users.

The command structure of the 20-column version is echoed and enhanced in the 40-column configura-

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tion. For example, Control-C in the 20-column version causes following text to be centred, while in 40 columns it produces a pop-up menu which lets the user choose centred, left, right, or left and right justified text. The Control-O command provides the options of underlines, italic, bold-face, outline, subscript, or superscript text.

This consistency carries through to the 80-column version and conforms to Sunburst's claim that Magic Slate is "the word processor that grows with you." Commands which work at one level will also work at a more advanced level, but other options may be added. The publishers obviously hope that this feature will mean acceptance at all levels of schooling. Perhaps software like Magic Slate could provide some continuity in the computer skills that children learn in our schools; at present skills learnt in the classrooms of enthusiastic primary teachers may be lost through lack of use at secondary level.

Magic Slate comes with very comprehensive documentation. The compact 58-page reference manual, typeset on good-quality paper, is supplemented by two quick reference cards and a 200-page teacher's guide in a ring-binder. This guide includes a set of notes on classroom management, more than 20 fully-described lesson plans for teaching specific word-processing skills,a reproducible booklet designed to introduce new users to the 20-column version, a tutorial/handbook which describes the features of Magic Slate, and a description of the enhancements of the 80-column version.

An excellent feature is the ability to customise the printer driver by entering hexadecimal ASCII codes for the various type-styles. You can accordingly set up one Magic Slate disk to produce wide text, or to print bold face type in text mode and outline type in graphics mode. If you have some experience with printer control codes, there are many possibilities for enhancing published work. One useful change is to increase dot-density to enhance the appearance of work printed in graphics mode, as standard-density graphics mode does not produce characters as sharp as text mode.

For the experienced user, Magic Slate is a capable and easy-to-use word processor. For use in schools, it is easily the most versatile word processor I have seen. It is simple to use, and yet offers plenty of features for formatting text and special typefaces. These are shown on-screen as they will appear when printed, perhaps Magic Slate's most valuable feature.

The 40-column version is ideally suited to classroom publishing, and has most of the features of the 80-column version. The most significant differences in the 40-column format are the inability to use wildcard characters in search and replace operations, to load and save marked blocks of text, to create macros, or to use two drives in working with files.

I anticipated problems with the last point, but Magic Slate transfers its overlays when creating a data disk, so that you can remove the program disk after booting Magic Slate. This is a convenient and secure arrangement for classroom use, where single drives are probably the norm. The other features missing from the 40-column version would not be missed in most classrooms, and detract little from the program's usefulness.

I would recommend Magic Slate to any school intending to use word-processing as part of a stimulating and coherent language/writing programme. Comments from teachers indicate that this program allows young children to achieve early success in word-processing, and yet serve as a useful and exciting tool for older users. It is extremely flexible and easy to use, powerful enough for serious use, and has several unique features. It sets a standard for educational software against which most other word processors compare unfavourably.

(Review copy of Magic Slate supplied by Allenby Educational Software, Takapuna, Auckland. Price $198 incl. GST).

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Apple //e tip

Dear Sir,

I recently got PRODOS and as I didn't really know much about it, I decided to go inside and find out how it really worked. In doing this I found some nice little routines that can be built into DOS 3.3 to make it more powerful. This can be done with a sector editor, but it is much easier just to load the wanted parts into RAM.

When a PRODUS disk is booted, the first sector of the disk is loaded into $800 (Boot 1) and then this routine loads another section (Boot 2) into $2000 and executes that, which routine then runs the startup file. However, when Boot 2 has been loaded and executed, the memory at $2000 is lost, and somehow we must stop it from doing this. The following routine will load Boot 2 but not execute it, so we can read it and copy the routines we want.

Firstly we need to load and modify Boot 1 so that it only loads Boot 2. The Apple already has a page of memory just for that, but because it's in ROM we will have to move it down to somewhere useable in RAM.

1) Type CALL-151 to get into the monitor.
2) Move the routine we need into RAM somewhere out of harm's way by typing 7600<C600. F6F7M.
3) Now enter the following patch:

```
$76F8 85 00          STA $00
$76FA A9 60          LDA #$60
$76FC 8D FC 08       STA $08FC
$76FF A5 00          LDA $00
$7701 4C 01 08       JMP $0801
```

Enter it by typing 76F8:85 00 A9 60 8D FC 08 A5 00 4C 01 08

4) Save it if you want by typing BSAVEBOOT0, A$7600, L$104.
5) Insert a PRODOS disk and execute it by typing 7600G. It will sound like a disk booting up (because it is), then the disk will click for a few seconds and will stop with the monitor prompt. Now you are ready to investigate the DOS.

With a few small changes this idea could be used on other DOS to find out what makes them tick!

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MACHINE LANGUAGE

What's the score?

by Joe Colquitt

The feature that has made computers so much in demand is their capacity to throw numbers around their insides at reckless speed. The display or output of figures is a prime consideration for any programmer, as the end user will pore over a spreadsheet or database. And who can honestly say it's not how you play the game, it's how many points you get?

Number conversions are an integral part of ML programming, and there are various types of conversion. The most common would be converting the contents of a byte (0-255) into a three digit decimal.

The in-situ form of a byte's content is 8 bit binary. If I said a byte contained 11000101, that doesn't mean a lot to most people (it doesn't mean much to me either). However, if that was represented as C5 hexadecimal or 197 decimal, then it assumes some sort of magnitude.

The procedure for a decimal conversion (Routine 1), merely performs successive subtractions to determine hundreds, tens, and units. These are stored and then converted to screen codes. To convert larger numbers requires that the source bytes have greater powers of ten subtracted, to determine 1000s, 10000s etc. Multiple byte subtraction was covered by this column in November 1985. Subtraction is performed because the 6502 does not have an inherent DIV instruction.

A less common conversion is binary to hex. Routine 1 would convert 11000101 to 197 decimal, but any work in machine code is usually done in hex. That requires 11000101 to be shown as C5, which Routine 2, a much simpler computation, will accomplish. Numbers larger than FF are simply concatenations of several bytes. For example, if two bytes held the binary 10110010 11010100, that would split into the four nybbles 1011 0010 1101 0100, which convert to B2D4 hex.

The examples below require that the byte to output be in the accumulator. The LDA$C100 is just to produce an immediate result. In a typical application, the routines would be called from the main program. The number is printed straight after the last thing printed. Naturally you would need to organise where the number is printed, for your particular format, either on the screen or the printer. Both devices use $FFD2 to print, and previous articles show how to change output direction (CMD).

NB: BASIC 'PRINT' differs from JSR$FFD2 in that PRINT adds a Carriage Return to the end of the last PRINT sequence and printing starts on a new line (unless; is specified). JSR$FFD2 prints consecutively unless a Carriage Return (#$OD) is printed. The position of the first digit can be set by calling $FFF0, as in Routine 3, or by printing #$93 (cls), #$13 (home), or #$2C (,).

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Routine inspection

by Gary Parker

Most beginners spend so much time trying to get their computers to do what they want, that they seldom stop to think about how the computer actually works. What makes it come up with a copyright message when it's turned on? What makes it able to solve SIN and COS and so on? What makes it understand a Basic program?

The fact is that every time you turn your Spectrum on, you activate a 16K machine code program called the monitor which controls everything the Spectrum does. The monitor is stored in ROM so that it is retained when the power is turned off.

The monitor was written by programmers just like any other program. The Spectrum's monitor is a complex machine code program which can be divided into nine routine sections: restart, keyboard, loudspeaker, cassette handling, screen and printer handling, executive, Basic, expression handling, and arithmetic routines.

Using hexadecimal notation, the monitor runs from 0000 to 3FFF, which is the first 16K of the Spectrum's total 64K of memory. Let's take a walk through the monitor and see what it contains.

At 0000 there are restart routines. These are jumped into whenever the computer is turned on, or an error occurs, or various other functions have to be performed.

First there is a start routine at 0000. This simply disables interrupts and sets the DE machine code register pair to hold the address of the highest point in RAM, so that the computer will know how much memory is available.

An error routine begins at 0008, which sets a pointer to point to the position of any error found in a Basic program. At 0010 is a 'print a character' routine. This takes whatever character code is held by the A machine code register and prints that character on the screen.

Several other restart routines which are less useful to us occur after that, and then at 0095 token and key tables are stored. This is not a program, but a long list of token references which allow characters and tokens (such as AT and PRINT) to be assigned to their proper character codes.

At 028E the keyboard routines begin. Each time the machine calls this address, the DE register pair returns the key code pressed. The E register is assigned a number between 1 and 40, depending on which of the 40 keys on the keyboard have been pressed, and the D register indicates whether Caps Shift or Symbol Shift have been pressed.

The keyboard routine proper begins at 02C6. This is called 50 times a second by the computer to see if a key has been pressed.

At 03B5 the loudspeaker routines begin. They work out frequencies and durations from the values you give in BEEP statements. Then the Spectrum's inbuilt loudspeaker is turned on and off at the appropriate frequency.

The cassette handling routines begin at 04C2. The Spectrum is well known for its ability to load poor recordings of programs, and this is because the cassette handling routines are well-written. They are designed to be able to cope with variations in sound and tape speed, unlike the cassette routines of the ZX81 which is a fussy loader in comparison.

Spectrum programs are saved with a short 'header' program which is 17 bytes long. This gives the computer information on the program it is about to load. Both the header and the main program are preceded by a leader tone which prepares the computer for loading the program. Listen to a recording of a program and it is possible to hear these parts. First is an even note which is a leader, then a 'pip' which is the header, then another leader, and finally a long shrieking hum which is the program.

The program is actually saved as a series of very short beeps and spaces. Each beep is either short, representing a zero bit, or long, representing a 1 bit. These beeps show up as stripes around the screen picture when loading or saving.

The cassette handling routines begin with some control routines at 04C2. Then at 056B are load routines, followed by save routines at 0605, and finally merge routines at 08B6.

Screen and printer handling routines begin at 09F4. First is a routine which calls the restart routine

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which prints a character. Then comes a control character table which governs the printing of complex characters such as BRIGHT and INK, followed by routines controlling new lines and so on. These are used for both the screen and the ZX printer.

Executive routines begin at 11B7, controlling most of the other routines in the monitor. At 1B17 the main routines of the Basic interpreter begin, to convert lines of Basic program to machine code while the program is running.

Expression evaluation procedures work out answers to numerical expressions in Basic programs. These begin at 24FF. Arithmetic routines are stored at 2D4F. All numbers between –65535 and 65535 are stored in two bytes as a 'short' form. Numbers outside this range are stored as a 'long' form and take up five bytes. They also take slightly longer to work with, which is a point to bear in mind when writing programs.

At address 32C5 is a table of commonly used numbers – zero, one, half, half of Pi, and ten. Presumably looking up a table for these values is faster than producing the numbers from scratch each time.

A table of addresses begins at 32D7. These are addresses of subroutines in the monitor which are jumped to by other routines. Floating point calculations are performed by routines situated at 335B. After these comes a series generator at 3453 which generates the polynomials used to produce SIN, COS, and so on.

Locations 386E to 3CFF are unused, and lastly, locations 3D00 to 3FFF hold the character set. Each character is defined by eight bytes, one byte for each row of pixels in the character, and each byte has eight bits, one bit for each pixel in a row.

So that's it – the monitor from start to finish. Of course, I haven't given you enough information to make extensive use of the monitor in your own programs, but at least now the monitor shouldn't be a complete mystery to you. If you want to delve further, use a dissassembler program to give assembly language listings of parts of the monitor. Then you can find useful routines for yourself.

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SYMBOL simplified

by Bryce Utting

Even if (like the rest of us) you don't fully understand Sanyo's description of the SYMBOL command, you can still use it to create some imaginative headings.

But first an explanation of how SYMBOL works. As the manual says, the syntax is:

SYMBOL (X,Y), <string>, <horizontal mag.>, <vertical mag>, <colour>, <angle>

(X,Y) are the co-ordinates where the string is drawn. <String> can be an expression (eg. A$) or a constant (eg. "STRING") or a mixture (eg. A$+CHR$(34) + "STRING"+CHR$(34)) and contains the characters which are to be drawn.

The two magnification items specify the size of the string on the screen. A value of 1 gives normal size, 2 double size, 3 triple and so on. Note that what the manual says is not entirely true: both X and Y magnifications are multiplied by 8 dots (not 8 and 16). This error is probably due to the eccentric nature of the screen, so to get a square character, one that *looks* square, the X magnification must be twice that of the Y.

<Colour> and <angle> are both optional. <Colour> uses the usual codes (0 to 7) and will default to the current colour. If you ever want it to default to the background colour, specify PRESET (you could also use PSET to draw in the default colour, which has the same effect as leaving out the <colour> parameter altogether). <Angle> tells BASIC how much to rotate <string>. 0 means no rotation (default). 1 means rotate 90° (down), 2 is rotate 180° (upside down, from right to left – try it!) and 3 rotates 270° (up).

When (if?) you understand all this, run some of the programs (the imaginative headings promised).

Program 1 shows one of the simplest. A character is drawn first in one colour (as a "shadow") and then in another, over the top of the first. Note that this idea is used by all the programs.

Program 2 is an example of a "solid" shadow, made by drawing multiple layers. The individual layers don't have to be the same colour – see program 3.

Program 4 introduces a new concept – two layers are drawn as in program 1 (except that they are both the same colour) but a third is drawn halfway between them in the background colour, to create an outline. More layers can be drawn behind this – see program 5.

Program 6 is more complex. Lines 70-90 draw an outline (in two colours), which is the easy part. What happens between lines 100 and 140 may not be so clear.

The main point is that a GET and a PUT command is executed in every iteration of the loop, for every line of the text. Each time through the loop, a line is picked up (with GET), erased (with LINE, otherwise a trace is left) and replaced in a new position to the right. As the title implies, this results in text written in italics. The "+Y/2" in line 130 is the crucial part, as this

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(Continued from page 89)

determines the slope of the letters. Try replacing it with:
+Y (or even –Y)
+2*SIN (Y/2)
+1 – (Y MOD 3)

One last thing – it has been said time and time again, but is well worth repeating in black and white: **GET and PUT commands will work on the 128K Sanyo.** You won't be able to manipulate the entire screen, but you should be able to create arrays large enough to GET fair-sized chunks of it.

```
10   ' Program #1
20   '    Single shadow
30   COLOR 5,1:CLS
40   INPUT A$
50   X=320-LEN(A$)*16
60   SYMBOL (X,100),A$,4,4,0
70   SYMBOL (X+10,105),A$,4,4,7
80   A$=INPUT$(1)
90   IF A$=" " THEN RUN
100  END

10   ' Program #2
20   '    Solid shadow
30   COLOR 5,1:CLS
40   INPUT A$
50   X=320-LEN(A$)*16
60   FOR N=0 TO 10
70   SYMBOL (X+N,100+N),4,4,0
80   NEXT N
90   SYMBOL (X+N,100+N),4,4,7
100  A$=INPUT$(1)
110  IF A$=" " THEN RUN
120  END

10   ' Program #3
20   '    Program #2 with colour
30   COLOR 5,1:CLS
40   INPUT A$
50   X=320-LEN(A$)*16
60   FOR N=0 TO 10
70   SYMBOL (X+N,100+N),4,4,N MOD 7
80   NEXT N
90   A$=INPUT$(1)
100  IF A$=" " THEN RUN
110  END

10   ' Program #4
20   '    Outline
30   COLOR 5,1:CLS
40   INPUT A$
50   X=320-LEN(A$)*16
60   SYMBOL (X-1,99),A$,4,4,7
70   SYMBOL (X+1,101),A$,4,4,7
80   SYMBOL (X,100),A$,4,4,1
90   A$=INPUT$(1)
100  IF A$=" " THEN RUN ELSE END
110  END

10   ' Program #5
20   '    Program #3 + Program #4
30   COLOR 5,1:CLS
40   INPUT A$
50   X=320-LEN(A$)*16
60   FOR N=0 TO 10
70   SYMBOL (X+N,100+N),4,4,N MOD 7
80   NEXT N
90   SYMBOL (X+N-1,74+N/2),A$,4,4,7
100  SYMBOL (X+N+1,76+N/2),A$,4,4,7
110  SYMBOL (X+N,75+N/2),A$,4,4,1
120  A$=INPUT$(1)
130  IF A$=" " THEN RUN ELSE END
140  END

10   ' Program #6
20   '    Italics
30   COLOR 5,1:CLS
40   INPUT A$
50   X=320-LEN(A$)*16:XE=320+LEN(A$)
     *16:H=32:X1=X-16:X2=XE+16
60   DIM ITALIC%(200)
70   SYMBOL (X-1,99),A$,4,4,7
80   SYMBOL (X+1,101),A$,4,4,0
90   SYMBOL (X,100),A$,4,4,1
100  FOR Y=0 TO H+1
110  GET (X1,132-Y)-(X2,131-Y),ITAL
     IC%
120  LINE (X1,132-Y)-(X2,131-Y),1,B
     F
130  PUT (X1+Y/2,131-Y),ITALIC%
140  NEXT
150  A$=INPUT$(1)
160  IF A$=" " THEN RUN ELSE END
170  END
```

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A GEOS solution

Several tenacious readers have discovered a solution to the problem Joe Colquitt struck in trying to run his Riteman printer when using GEOS 1.0 on his C-64, as he described last month.

The answer, it seems, is to choose the Print option in the GEOS window in the normal way. The disk drive will run for a few seconds, and when the red light goes off, the Riteman should be turned off momentarily. The document should then print normally, although it has been pointed out that the program will crash at the end of printing and will need reloading.

The technical reason is that switching the printer off and on again deletes the clearing polling signal sent by GEOS and which is unrecognised by the Riteman. This enables the printer to accept the raw stream of data.

Further investigation reveals that version 1.2 of GEOS will run the Riteman printer with no problems, although switches 2 and 3 may need to be on.

Joe Colquitt would like to thank all those readers who wrote in with suggestions.

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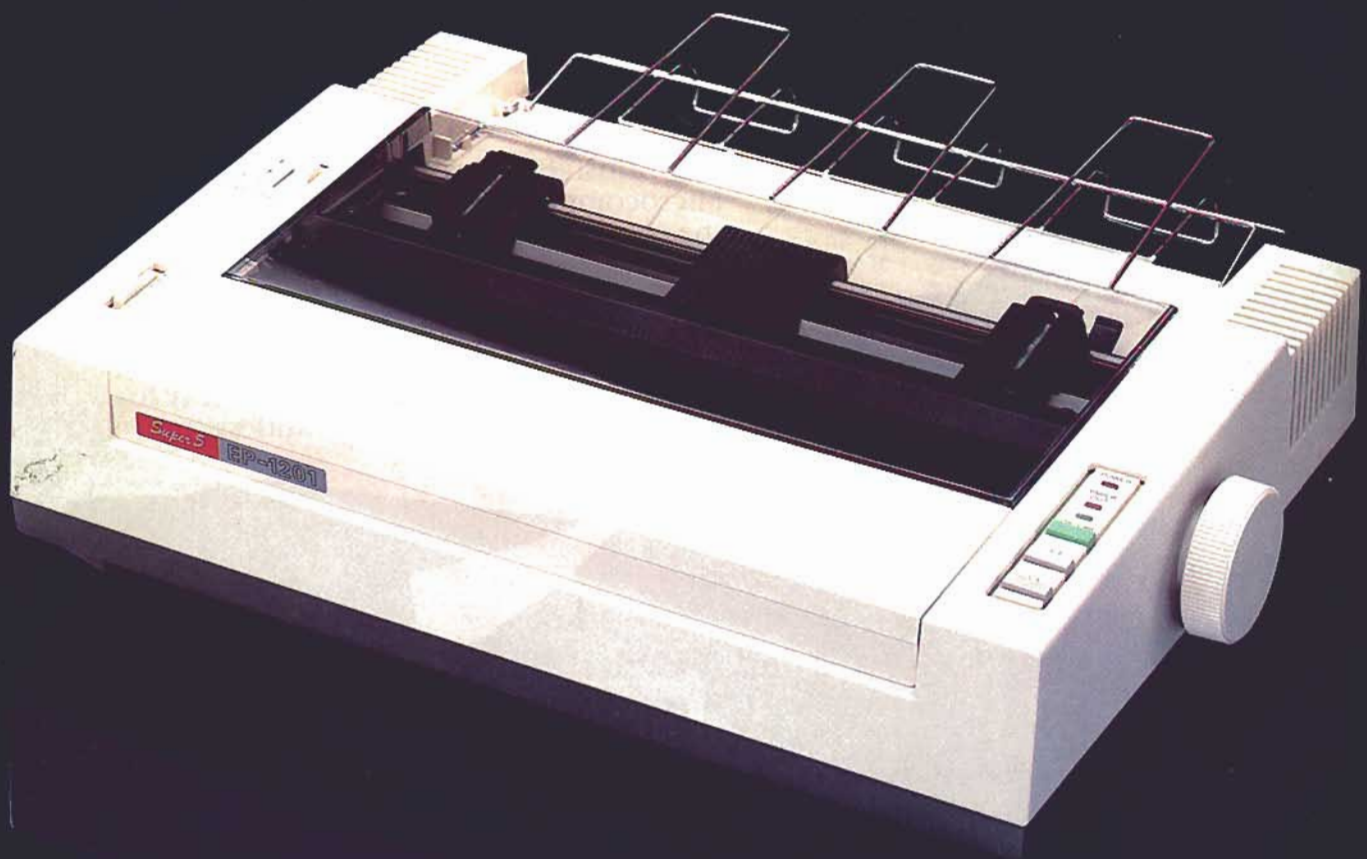

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